WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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WORK WORLD.

THE police authorities in the North are taking to the cycle. The Chief Constable of Lanarkshire, we hear, is making inquiries with a view to mounting a portion of the county police on bicycles. It remains to be seen how far the plan will prove successful.

* *

The Volunteers have already a number of cycling corps in various parts of the Kingdom, and fresh corps are being formed—one of the latest being the Queen's Rifle Volunteer Brigade, Edinburgh, the cycling contingent of which is already fifty strong.

* *

As an "up-to-date" substitution for the decorative trades' gold leaf, the great dome of the Administration building at the Chicago Exhibition, and the four smaller domes, are to be covered with *aluminium bronze*, a newly discovered amalgam, which is said to glisten brighter than gold. The cost of the foregoing will be about £11,000.

* *

Just recently an Electrical Engineering Co. of Bradford received an order to instal 250 incandescent lamps in the Vatican Bazaar held in the Leeds Town Hall. The whole of the lamps were erected and burning by 12 o'clock next day! Smart work this; yet the cables were fitted in accordance with the fire insurance rules, and to the satisfaction of the Borough engineer.

* *

The bicycle is now being recognised in military circles as a means of rapid locomotion, although the Government is somewhat chary of supporting the movement to any considerable extent. Some of the military experts are, however, enthusiastic over the capabilities of the cycle as an instrument of great utility in the hands of scouts and messengers.

* *

A machine for sewing account books has at last been met by an invention which is being adopted as a labour-saving machine. The system of sewing is much superior to hand work, and books can be sewn tight or slack as desired. It is capable of producing all kinds of work, from small memo.'s to the ledger; from one to six needles can be used. It is easily learned, and gives no bad work.

A new water cycle has been lately constructed and experimented with. The cycle, which takes the form of a triple boat, is propelled by three riders, who set in motion a screw propeller similar to that of an ordinary screw steamer. It travelled at the rate of ten miles an hour on its trial trip, and is said to be capable of greater pace. The trial seems to have been satisfactory.

* *

It will be both an interesting and amusing item of reading for our operative paperhanging readers, that in the City of New York the custom largely prevails of trimming the wall-paper after it is pasted, length by length. The idea of this is, that the risk of getting paste on the front edges is materially lessened. What would be thought of a professional paperhanger on this side who could not paste his lengths clean?

* *

The Plumbers' Registration Bill, under consideration of Parliament, is, it appears, causing a considerable stir amongst the ironmongers of the country, and energetic measures are being adopted to ensure its rejection. The ironmongers contend that the passing of the Bill will create a monopoly injurious to them, master ironmongers being debarred from taking a registered plumber's certificate unless they can handle the tools. This is unfortunate for the plumbers—but what will householders say?

* *

The Manchester lath-renders recently held a meeting to consider the best course to take to prevent the extermination of their trade in this country, for extermination will evidently result if the imports of foreign laths increase at the same rate as they have done in past years. The foreign laths are Swedish, and are made by paupers. Thus the cost of production is small, and the laths are imported duty free as sawn timber, instead of fully manufactured articles, which they really are. It was decided to question candidates for Parliament on the subject.

* *

Bronze kid is still being very much worn for ladies' evening boots. It is as well, therefore, for those who make such, to know that the odd cuttings, such as the shanks and flanks of the skin, being loose, will, if stretched the reverse way of their line of tightness, throw the bronze up in small flakes upon the surface; this being placed across the two middle fingers makes a good rubber to brighten up the new shoes. The frictional heat given out in the brisk rubbing causes the bronze to leave the loose and adhere to the tight leather.

* *

The process of embossing ordinary wall-papers has this last few years been brought to a special degree of perfection. So admirably are the plain and cross threads and fibres of fabrics imitated, that the play of light, which heretofore has been the particular artistic quality of silk for wall-covering purposes, can be made to imitate the surface-sheen of this and almost any other fabric. That which is being done in ordinary papers is now carried to equal perfection with relief wall decorations. We have seen some inexpensive effects in this product that would require the skill of an expert to distinguish, without touching, from stamped leather, tapestry, and other fabrics. Japanese leathers continue to hold sway for artistic effect and brilliant display at a moderate outlay. The richness furnished by the cheap lacquered metal cannot be rivalled at the same cost by any home application of skill and labour.

* *

One of the most striking aspects of decorative trades' development is the tendency to separate the branches having a direct connection with applied art from those related to purely structural or sanitary science. Interior decorative painting, glass painting and staining, the re-modelling of apartments, and the upholstery branches, are getting gradually, but universally, absorbed into one business, under one controlling mind—the "interior architect," or "specialist in decorative interiors." Plumbing, gas and electric lighting, heating apparatus and ventilation, require to be directed by those possessing special scientific training as well as craftsmanship. It is readily granted that very few architects can possess the special knowledge which qualifies dealing with both the above-mentioned exhaustless divisions of modern work. Hence the growing division of responsibility, and the near prospect of three recognised classes of architects—the "structural," the "decorative," and the "scientific."

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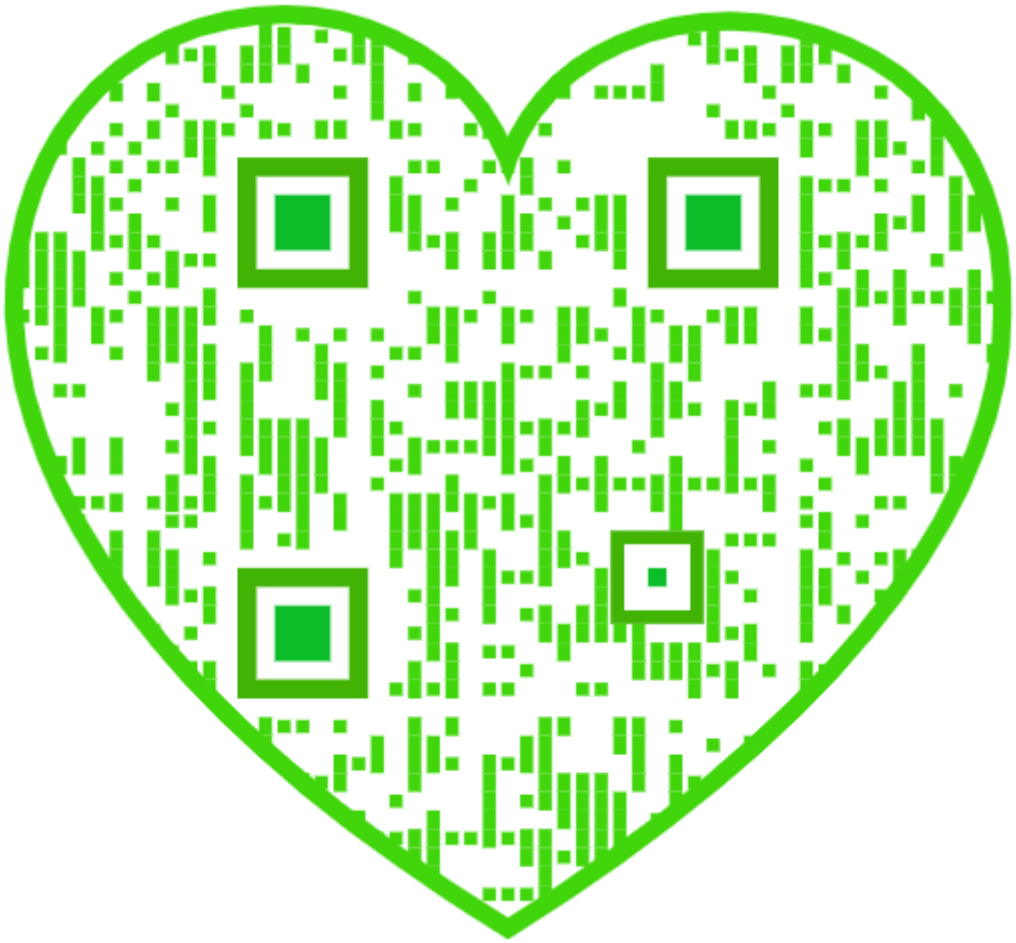

HAND-WORKING OF SPECULA FOR THE NEWTONIAN TELESCOPE.

BY EDWARD A. FRANCIS.

WHAT THE NEWTONIAN TELESCOPE IS—METAL AND GLASS SPECULA—REFLECTING AND REFRACTING TELESCOPES.

I PROPOSE to set out plainly and briefly a few notes on the manual process of grinding, polishing, testing, and silvering, glass specula for the Newtonian telescope.

In the year 1674, Newton made the first reflecting telescope of the pattern which bears his name, having previously given up the attempt to make an achromatic refracting telescope.

The first Newtonian telescope was, I believe, barely six inches in focal length. The curious may verify my recollection, and at the same time see an engraving of the instrument in the "Transactions of the Royal Society." As likely to be of more practical use, I give instead, in Fig. 1, a sketch of a modern pattern Newtonian, simply mounted. In Fig. 2 the action of the instrument is shown. The large concave speculum, A, reflects the light rays back to a point B, where, if uninterrupted, they would form an image of a star, or of whatever other object might be under examination. But, if the observer looked down the tube to examine this image, his head would block away nearly all the incident light. To avoid this, the converging reflected rays are intercepted by the small flat mirror, C, and turned aside so as to form the image at D, where it may be comfortably examined by means of the magnifier, E, called the eye-piece.

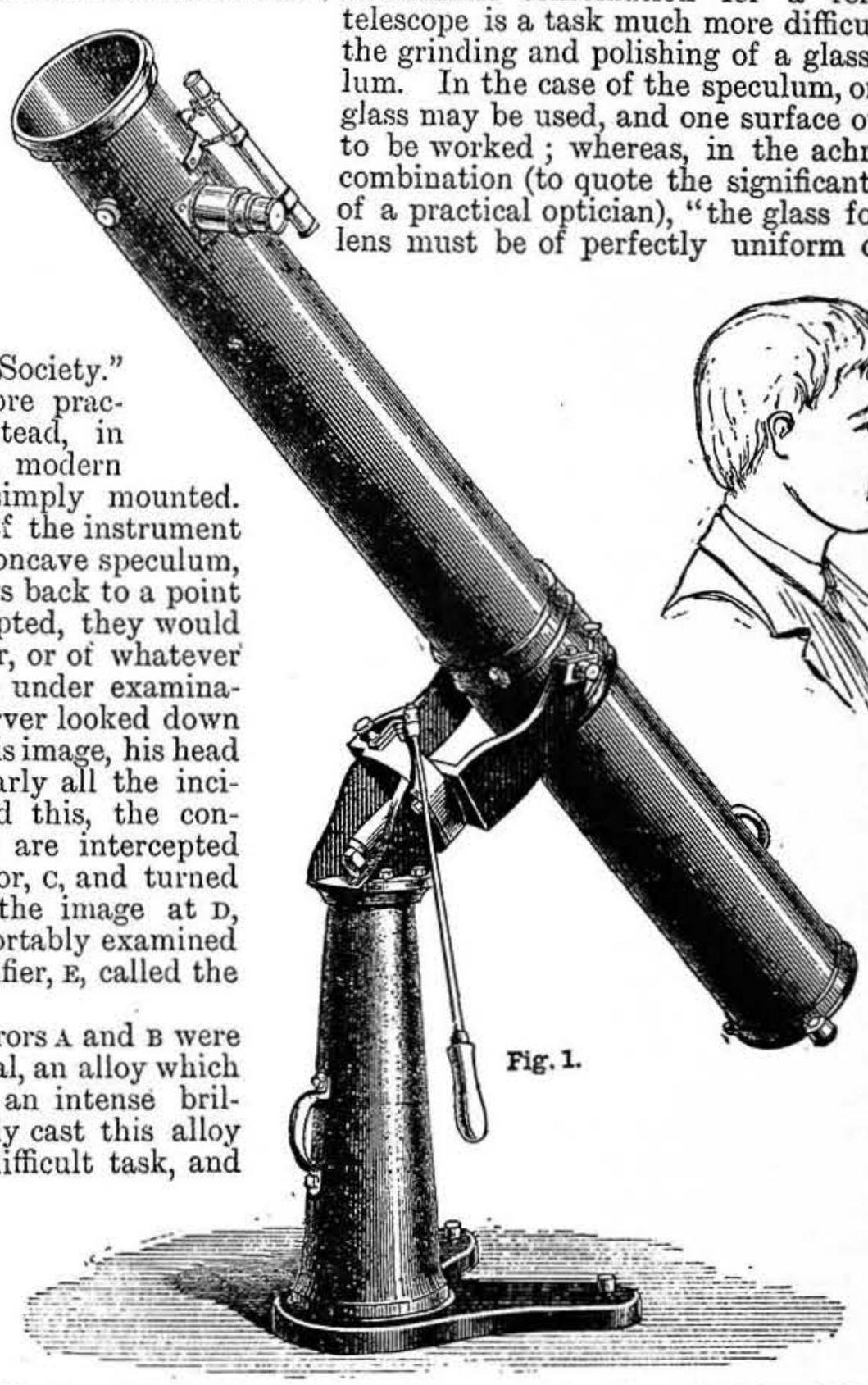

Fig. 1.

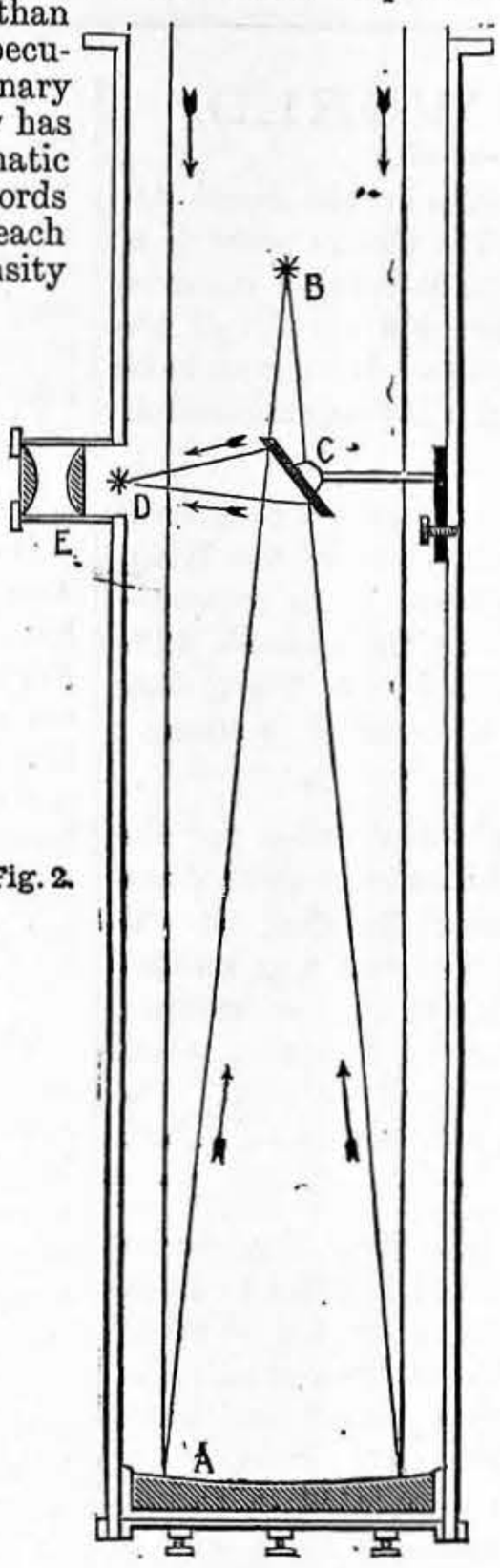

Fig. 2.

Fig. 1.—A Newtonian Telescope (by permission of Mr. G. Calver, F.R.A.S.). Fig. 2.—Section, showing the Action of the Mirrors.

At one time the mirrors A and B were made of speculum metal, an alloy which could be polished to an intense brilliancy. To successfully cast this alloy was, however, a very difficult task, and failure was frequent. Too much tin rendered it so brittle that a slight blow, or the expansion of a few drops of water in freezing, sufficed to shatter it; while, on the other hand, the addition of copper, while it toughened the metal, gave to it, at the same time, a yellow tint, and seriously affected the reflecting power. And even when the alloy was cast it was very difficult to grind and polish. Yet good telescopes were made, and the reflecting telescope reigned supreme until the secret of combining flint and crown glass lenses, so as to correct the chromatism which baffled Newton, was discovered. Then the reflector fell into comparative disuse, because of the difficulties connected with its manufacture. An achromatic combination of lenses, once completed and matched, never required retouching; whereas the metal specula often tarnished, and had to be repolished, and perhaps lost in the process the exquisite curve which made them valuable.

But, in 1856, the plan of forming specula of glass covered with a silver film was tried experimentally, and the experiment succeeded. The glass was ground and carefully polished to the necessary curve, and then a film of pure silver, not more than $\frac{1}{200000}$th part of an inch in thickness, was chemically deposited on the polished surface. When the silver tarnished, it needed but to remove it with acid, and replace it with a fresh deposit, the basis curve of glass remaining always perfect. And glass could be so much more easily and satisfactorily worked than any speculum metal, that the reflecting telescope at once took its place again as an instrument in common use.

I add one or two facts in anticipation of questions which are likely to be asked.

To grind and polish the lenses of an achromatic combination for a refracting telescope is a task much more difficult than the grinding and polishing of a glass speculum. In the case of the speculum, ordinary glass may be used, and one surface only has to be worked; whereas, in the achromatic combination (to quote the significant words of a practical optician), "the glass for each lens must be of perfectly uniform density and ascertained refractive index . . . . an elaborate process shows what curves are necessary, and then comes the grinding and polishing of at least four surfaces, and lastly, the edging and correct centring of the worked lenses."

The difference in the labour is shown in the price of the finished work of the best makers. A nine-inch silver on glass speculum by a workman of reputation may be had unmounted for less than twenty pounds; an achromatic combination of the same diameter, also unmounted, is catalogued at two hundred pounds.

Very little, if anything, is gained, so far as common astronomical work is concerned, by the use of the expensive lens. It is, of course, better for some purposes; but in planetary and lunar work, and for ordinary star-gazing, the advantage rests rather with the comparatively inexpensive speculum.

MICROSCOPE EYE-PIECES.

BY O. BECKERLEGGE.

ONE of the best proofs of interest taken in any subject is when the said subject is made to pass under criticism. No one can complain when this is done in a generous, friendly spirit, made for the purpose of helping to a just conclusion. Indeed, this is the very soul of all advance in improvement: without it there must be stagnation and utter sterility of ideas. At the same time, the main purpose of the writer must be made the subject of criticism, and not what the critic would import into it.

These reflections were occasioned by some remarks made in a friendly way by a correspondent on the design I gave some time since for a microscope. Exception was taken to the fact that chief attention was given to the "brass," and but little said about the "glass." Well, that was the writer's intention. Our critic said that the brass-work to him was "mere child's play," and so he made light of it; but, as his knowledge was somewhat scant on optics, his requirement was information on eye-pieces, etc. Very good; but one wonders how many find the brass-work "child's play." From the writer's standpoint, the arrangement of lenses is mere "child's play," and has been for forty years; but it is only during the last few years that he has acquired anything like proficiency in mechanics. So, perhaps, both the writer and his critic have made the mistake that those subjects which are child's play to them must of necessity be the same to others. It is to correct such an error, if it be one, that he seeks to offer a few words on the construction of the eye-piece of a microscope; and, first of all, just a word about eye-pieces in general.

There is this difference between the eye-piece of a telescope and microscope: on a telescope a much higher power can be used than on a microscope. In the former, a long focus object-glass is used, consequently the image is not magnified to any great extent; the main magnification is made by the eye-piece. In the microscope the object-glass is of short focus, and consequently magnifies the object in proportion. For example, suppose normal sight is 10 in., then, if we use a lens which has a focal length of 5 in., the eye is brought twice as near to the object, and

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consequently the object will appear twice as large. Or, if we use a lens 2½ in., then the diameter will be magnified four times, and so on, up to ½ an inch, or other high power. Of course, a high-power eye-piece could be used on any object-glass. But there is this drawback: in all object-glasses of high power, except those of the highest possible quality, there will be some little defect; and to use a high-power eye-piece would be to magnify the image of the object defects and all. Thus, from the construction of the instruments, a much higher power eye-piece can be used on the one than on the other.

Eye-pieces for the microscope are sometimes designated A, B, C, D, etc. They consist of two lenses: a large one nearest the object-glass, called the field lens, and a small one nearest the eye, called the eye lens.

A general rule for diameters is that the field lens should be twice that of the eye lens; thus, if the field lens is 1 in. in diameter, the eye lens should be about ½ in. in diameter. The rule for focal length is that they should be as 2 to 1; thus, if the field lens is 1½ in., then the eye lens must be ¾ in. These are placed with their plane side towards the eye, and one-half of their combined focal length apart; thus, $1\frac{1}{2}+\frac{3}{4}=2\frac{1}{4}\div 2=1\frac{1}{8}$, so that they would be 1⅛ in. apart. A stop must be placed between these at the focus of the eye lens, the opening the same as its diameter.

To determine the focal length of the eye-piece, proceed as follows: Multiply the focal length of the lenses *into each other*, and then by 2, and divide the product by the focal lengths when *added* together; thus, $1\frac{1}{2}\times\frac{1}{2}\times 2=1\frac{1}{2}$: $1\frac{1}{2}+\frac{1}{2}=2$: $1\frac{1}{2}\div 2=\frac{3}{4}$, so that the eye-piece constructed by these lenses would be ¾ in. focal length.

The following are given by a manufacturing optician:—

1.	Eye lens,	1½	Field lens,	3	Distance apart,	2¼.
2.	,,	1	,,	2	,,	1½.
3.	,,	¾	,,	1½	,,	1⅛.
4.	,,	½	,,	1	,,	¾.

In making eye-pieces for the telescope, the relative focal length of field lens to eye lens is 3 to 1. In mounting the lenses in their cells, the plan already given should be followed. With these principles, any clever worker in brass should find no difficulty in making any required eye-piece.

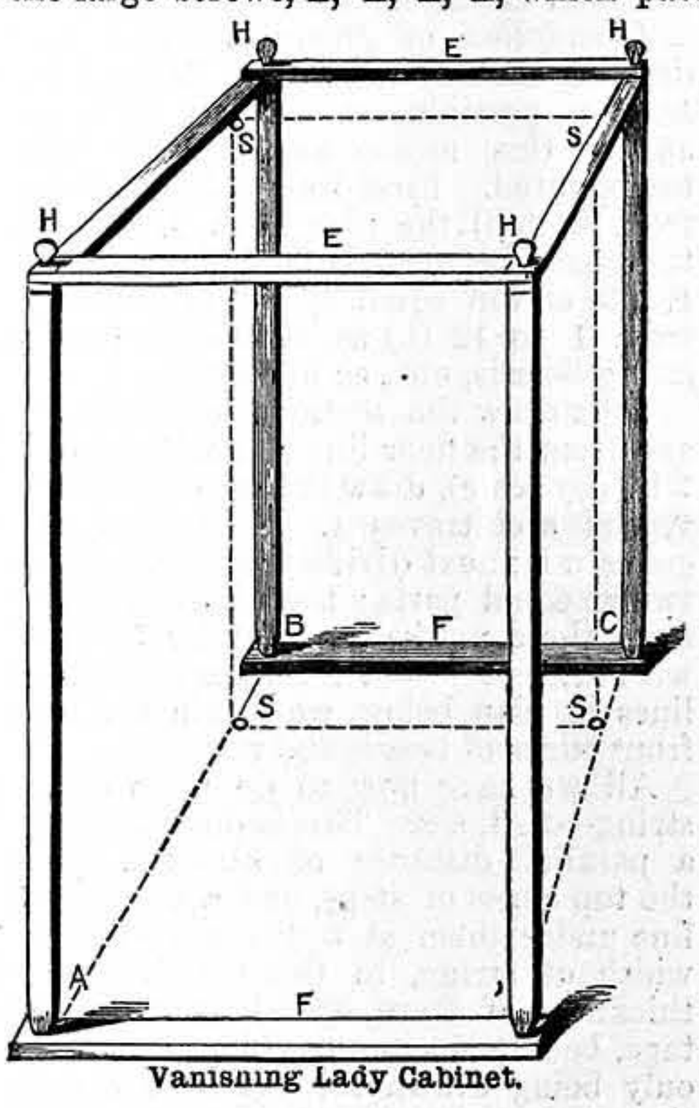
HOW TO MAKE A VANISHING LADY CABINET.

BY E. A. S.

From the above title the reader, no doubt, will imagine that a cumbrous and complex piece of mechanism is about to be described. This, however, as will soon be seen, is not the case, the apparatus being fairly portable and of exceedingly simple construction—so simple, indeed, that one might well wonder whether any audience would be taken in by it at all. That it is so deceived is the personal experience of the writer.

Briefly, the course of the trick is as follows: The curtain having been rung up—or, what is the same thing, the drawing-room folding doors swung open—an oblong cabinet is disclosed, covered inside with black cloth, and furnished with sliding curtains in front. A committee from the audience are then invited to make a thorough examination of the concern, particular attention being drawn by the exhibitor to the fact that there is no mode of exit except through the front. When the committee have satisfied themselves on this point, and have returned to their seats, the young lady is introduced, and a chair placed in the cabinet. She enters it, and sits down. The curtains are now drawn, the exhibitor remarking "that the fair medium is being rapidly precipitated through space." The audience look unbelieving, as well they may; but, the curtains having been thrown back, their incredulity soon merges into surprise, for certainly the young lady has gone, leaving the empty chair behind her. Nor is this all: for by a reversal of the process she reappears as mysteriously as she vanishes.

The accompanying illustration well represents the cabinet devoid of fittings. A, B, C, D are four uprights carrying the rectangular framework, E E, their lower ends being rounded off for insertion in the blocks, F, F, which are bored to receive them; their upper ends are also drilled for the reception of the large screws, H, H, H, H, which pass



Vanishing Lady Cabinet.

through, clamping the framework together, and fixing it to the uprights. Metal washers are interposed between the heads of the screws and the wood. Cross-pieces from A to B and D to C ensure further rigidity, but are not absolutely essential. A curtain rod and brackets complete the skeleton of the cabinet, which is now ready for draping. The best dimensions to vanish a full-grown person are: 6 ft. high, 4 ft. deep, and 3 ft. 6 in. broad; for a child it may be made proportionately smaller, but it must always be fairly deep.

Three pieces of black cloth are now required (any cheap material will do, provided it be not shiny): one, 15 ft. 6 in. by 4 ft.; two, 6 ft. by 3 ft. 6 in. The larger is tacked on inside the framework, and forms the sides and top, one of the smaller lengths being similarly fastened to the back. Small drawing-pins, with their heads painted black, are preferable to tacks, which are difficult to remove without injury to the fabric. Four little black eyes, s, s, s, s, are next attached in the position shown, 9 in. or 10 in. from the back, and a corresponding hook sewn on to each corner of the remaining piece of cloth. Sliding curtains in front and a dark rug for the floor finish the apparatus.

The working of the trick by this time will be pretty obvious. The young lady, having the material concealed about her person, steps into the cabinet, the curtains being closed after her. She then rises from her chair, quickly secures the cloth to the structure by means of the hooks and eyes, and takes up her stand behind it. The cabinet may now be opened, the audience looking in vain for the medium, who is safely ensconced between the false and real back, the increased shallowness being imperceptible to the keenest eye, especially if the sliding curtains are extended so as to hide the exterior sides. Her reappearance is, of course, an equally easy matter. It is a good plan to place two unshaded lamps to the right and left of the cabinet: these dazzle the eyes of the spectators, at the same time giving plenty of light; but care must be taken to allow no direct rays to fall on the back.

The performer can, if he likes, allow one of the audience to mount guard behind the cabinet during the performance. This, however, is open to two objections: in the first place, the spectator—or, rather, non-spectator—may want to see some of the fun himself and come round to the front, when at such close quarters the secret might reveal itself; in the second place, there is a possibility that, owing to natural curiosity or mistaken zeal, he may begin sounding the back of the cabinet with his fists, which at a critical moment would be decidedly awkward for the exhibitor, not to mention the medium.

THE ART OF STAIRCASING.

BY GEORGE F. CHILD.

Introduction—Models of Staircases—Storey Rod—Height, Going, and Width—Rough Sketch—Depth of Joist, Position of Windows, etc.—Setting out from Rod—Number of Treads and Risers—Proportion of Treads and Risers—Ordinary Sizes of Steps for different Classes of Buildings—Setting out Number of Treads and Risers—Data for Scale Drawings—Description of Drawing—Length of Strings—Pitch-board—"Wedge" Strips—Working the Strings—Use of "Router"—Nosing Plane—Enlarged Drawings—Forms of Rails—Putting Stairs Together.

Introduction.—In writing the following course of articles upon the art of staircasing, I had in view the great number of young men in the trade who, though good joiners perhaps (having had no opportunity), were not "in it" at making a flight of stairs. My endeavour, therefore, has been to supply this knowledge in as clear and simple a manner as possible, by giving full instructions, with the aid of suitable drawings, of all important and necessary parts.

Though this series has been written for persons engaged in the building trade, there is no possible reason why others should not profit by them. Indeed, I hope they may, for I feel sure that anyone desirous of taking up this interesting branch of the trade may, by close attention to the following course, meet with success; for, to my own knowledge (this, by way of encouragement), one of the best staircase hands in my district was for many years engaged as a coachman, not even knowing the use of the tools till he had grown up. After this, who will despair? For always remember "what man has done, man can do."

I would urge upon all interested in this work the necessity of thoroughly making

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themselves master of the elementary drawings, etc., as shown and described on page 53. There being, as we all know, no "royal road to knowledge," we must make up our minds for a certain amount of drudgery before becoming proficient in anything; therefore, as this page contains the elements of staircasing, we shall do well to master it. After this, each succeeding example will become easy, as the student will be led from point to point in a simple and sure manner, thus interesting and exercising the mind.

Models.—To give greater confidence, I would recommend the student to make a model to scale—say, 1½ in. to the foot—or, if only a part is taken (one of the string-boards, for instance), set out the treads and risers, cutting the string at top and bottom for the floor and landing, when it will be seen at once if the calculations have been correct. Having said this much by way of preface, we will proceed to business by examining the figures on page 53.

Storey Rod.—The first thing necessary is a rod of a convenient size—say, 12 ft. long and about 1½ in. square—for the purpose of taking dimensions of the proposed stairs from the building. We will suppose the landings and floors are "laid"; therefore apply the rod in an upright position from the ground floor to the trimmer joist above, drawing a line upon it level with the landing, as shown at H H on storey rod (S R, Fig. 1). Next apply the rod in a horizontal position from a "plumb" line, H H, as at G G, marking upon it "Going." Now take the width between the walls, W, W, as seen in plan, Fig. 2.

Rough Sketch.—We next make a rough sketch of the part of the building in which our stairs will be fixed.

Depth of Joist.—This being a very important point, as will be seen when we examine the following drawings, care should be taken in this respect by marking upon the sketch—Trimmer (T) 7 in. × 3 in., as at Fig. 1.

Position of Windows, etc.—It is very necessary that all openings for windows, doors, etc., should be known in setting out our stairs; therefore, mark upon the sketch their respective positions, with sizes figured in, as door 7 ft. × 3 ft., etc.

Setting out from the Rod.—We now, by measuring our rod, find that the height, H H, is 7 ft.; going, G G, 7 ft. 4 in.; and width, S S (Fig. 2), 2 ft. 6 in.

Number of Treads and Risers.—All will know that some stairs are easy of ascent, and others quite the reverse. Now the object of the staircase hand being to make his stairs as "easy" as possible, he must keep in mind a certain proportion (given below) in obtaining the number of treads and risers, and work as close to it as circumstances will allow.

Proportion of Treads and Risers.—To ensure "easy" stairs, the proportion of 10 in. for steps and 6 in. for risers should be as nearly worked in as possible, these being the standard sizes.

Ordinary Sizes of Steps for different Classes of Buildings.—Different classes of buildings, of course, require different classes of work; therefore, stairs of this description being only used in small houses, or as back stairs for larger ones, smaller sizes may be taken for the steps, etc.

Setting out Number of Treads and Risers.—Now, as 8 in. for treads and 7 in. for risers is a very good working proportion, we will see how it will work in. As the height, H, is 7 ft., we divide this by 7, which will just come out 12 inches, making 12 risers, there being in *all staircases* one *more* riser than tread (as the landing counts for one). We have now to divide the going, G G, into eleven parts thus: 7 ft. 4 in. divided by 11 will, of course, be 8 in. for the treads. As economy of stuff is a very important factor in all builders' yards, it will be always well to consider in arranging the stairs how the standard sizes of board, etc., can best be worked in; as often, by placing the riser behind or on top of the tread, stuff may be used in without waste. The stock sizes for boards are usually respectively, 7, 8, 9, 10, and 11 in.; therefore, in the case before us, 7 in. for the risers and 9 in. for the treads will do nicely, as this allows the riser to be nailed to back of step, and gives on the step seven-eighths of an inch for nosing.

Data for Scale Drawing.—Having this data to work upon, the next proceeding will be to construct a scale drawing to Fig. 1, sectional elevation, and Fig. 2, plan.

Description of Drawing.—The working drawing should, in *all cases*, be to as large a scale as possible—say, 1½ in. to a foot—as by this means any mistake will be exaggerated. First draw (taking particulars from sketch) the plan, Fig. 2, and divide the space between landing, L, and passage, P, into eleven equal spaces, and mark them from 1 to 12 (L) as shown, and draw all string-boards, etc., as in drawing.

Next draw the sectional elevation, Fig 1, and from the floor line F L, at the height of 7 ft. (by scale), draw the landing L, trimmer T, and architraves A. Now mark off the going, G G; next divide the height, H H, into twelve equal parts; then, by drawing lines from these marks horizontally to intersect with lines projected from the corresponding lines in plan below, we obtain the top and front edges of treads and risers.

All we have now to do is to draw the string-board, S B. This is done by marking a parallel distance of about 2 in. from the top edges of steps, and a corresponding line under them at a distance equal to the width of string, in this case 9 in. The thickness of steps, etc., may, with advantage, be left out in a working drawing, they only being drawn for the sake of description.

As it is very important that the treads and risers all be of one length, mark on a short rod the width of stairs, with thickness of strings on each end. Now, as the steps are "housed" three-eighths of an inch into the strings, mark that distance *within* the thickness, which gives the length required. Now mark this on two treads; place one on the bench with all the others on top, and the other marked one on top of all. Place the two that are marked as nearly opposite as possible, and draw a line down the edges of all from point to point, square each across, and cut off.

Length of Strings.—To obtain the length of board required for strings, take the distance between *a* and *d* (Fig. 1).

Pitch-board.—For this we require a piece of pine—mahogany would be better—about 12 in. square by ½ in. thick, with one angle planed *perfectly square*.

Setting out Pitch-board.—Now space off on rod with compasses the number of risers (12), and mark the distance *a b* on pitch-board, P B (Fig. 5), writing upon the board "Riser." Do exactly the same with going, and mark it at *a c*; draw a line between these points, which represents the pitch or angle of stairs. At a distance of 2 in. from this line cut off the board, and screw on a strip, as seen in section S. This answers the purpose of guide to run along edge of string.

Application of Pitch-board.—To apply the pitch-board, draw a line the whole length of string two inches from edge, as *a b* (Fig. 3); this figure shows the board fully set out. Now lay the pitch-board flat upon it, with guide pressed close to the edge; then, with a striking-knife run round the board from *a* to *b* and *c* (Fig. 4), being sure not to pass beyond the 2 in. line. Now slide the pitch-board up the string, making *a* coincide with point *c*, and continue this till the proper number of steps are drawn.

Wedge Strips.—Now obtain a thin strip of wood, and if the steps are one inch in thickness, mark on one end 1⅛ in. and on the other 1¼ in. This is for marking the space of wedging, and is applied as at *d e* (Fig. 4), one edge being placed against line made by knife, and a pencil drawn along the other.

Working the Strings.—At a distance of three-eighths of an inch from back edge of string gauge a line on the thickness; this is depth of "housing." Next, with a brace and centre-bit bore in a series of holes, as at *f* (Fig. 4), and clear out the space with a chisel, as at *g*. Next proceed with a tenon saw to cut in every line, as from *g* to *h*, and roughly clear out the space with a chisel.

Use of Router.—The router (Fig. 7) is a tool that can be made by anyone, and is made in various shapes. It should be about 6 in. long and 4 in. thick, with space cut out for plough iron and wedge, similar to a bead plane. We now insert a plough iron, projecting three-eighths of an inch at bottom, and work the tool along all the spaces to bring them to a uniform depth.

Nosing Plane.—This plane (Fig. 6) is used to work edges of treads or nosings.

Enlarged Drawings.—Fig. 8 is an enlargement of portion of string showing at *a*, tread; *b*, riser; *c*, wedge; *d*, block; *e*, bead; *f*, section of string-board, S B. Fig. 10 is also an enlargement of string at landing, L. A is the architrave; *a*, the nosing which is *always* left off, and fixed after the stairs are in position; *b*, floor boards; T J, trimmer joist, with *tusk tenon* cut on the end, to insert in trimmer T, as seen at *c*. This tenon should be one-sixth the depth of joist, its *bottom* edge being in the centre of joist, the necessary bearing power being obtained by letting in a piece below the tenon for a bearing, and at the top by cutting it as shown.

Forms of Rails.—At *a*, Fig. 9, is seen a form of rail that is often used where it is necessary to fix it to the wall. This is done by screwing it to plugs driven into the joints. *b* is another section; this is fixed on iron brackets, which are also fixed to wall.

Putting Stairs Together.—Place one string on the bench (under a beam in roof if possible), and place treads and risers in their places. Now put on the other string, and lay a piece of stout quartering on it; drive a few stout strips tightly between beam and quartering, and be sure the front edge of steps are in a line, and do not "wind"; now glue and drive in the wedges, nail the steps together at back and front, take off quartering and nail through the strings into steps, glue in three blocks at back as seen at *d* (Fig. 8), and the job is complete.

In my next paper the worker will be taken on to such important matters as newels, landings, balusters, mouldings, etc.

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Fig 10.

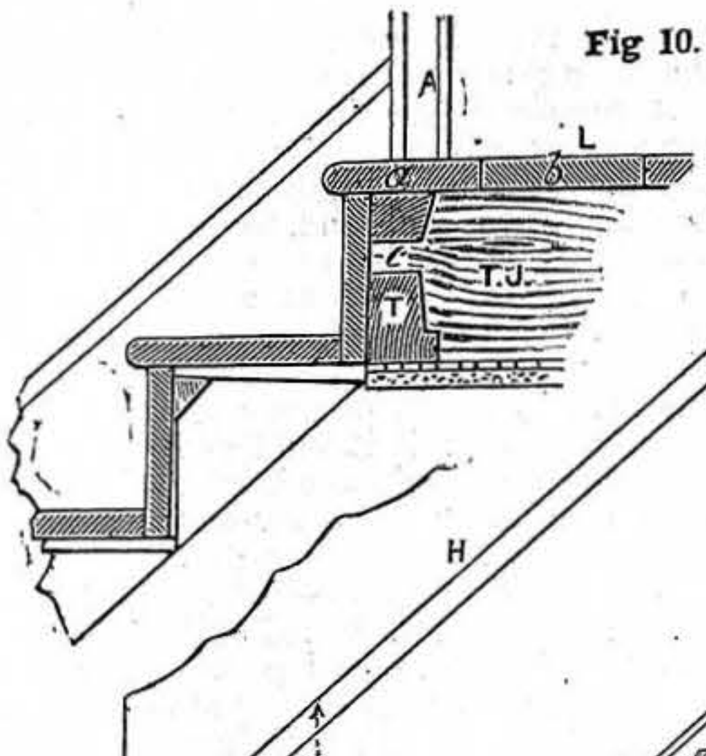

Fig. 1 SECTIONAL ELEVATION

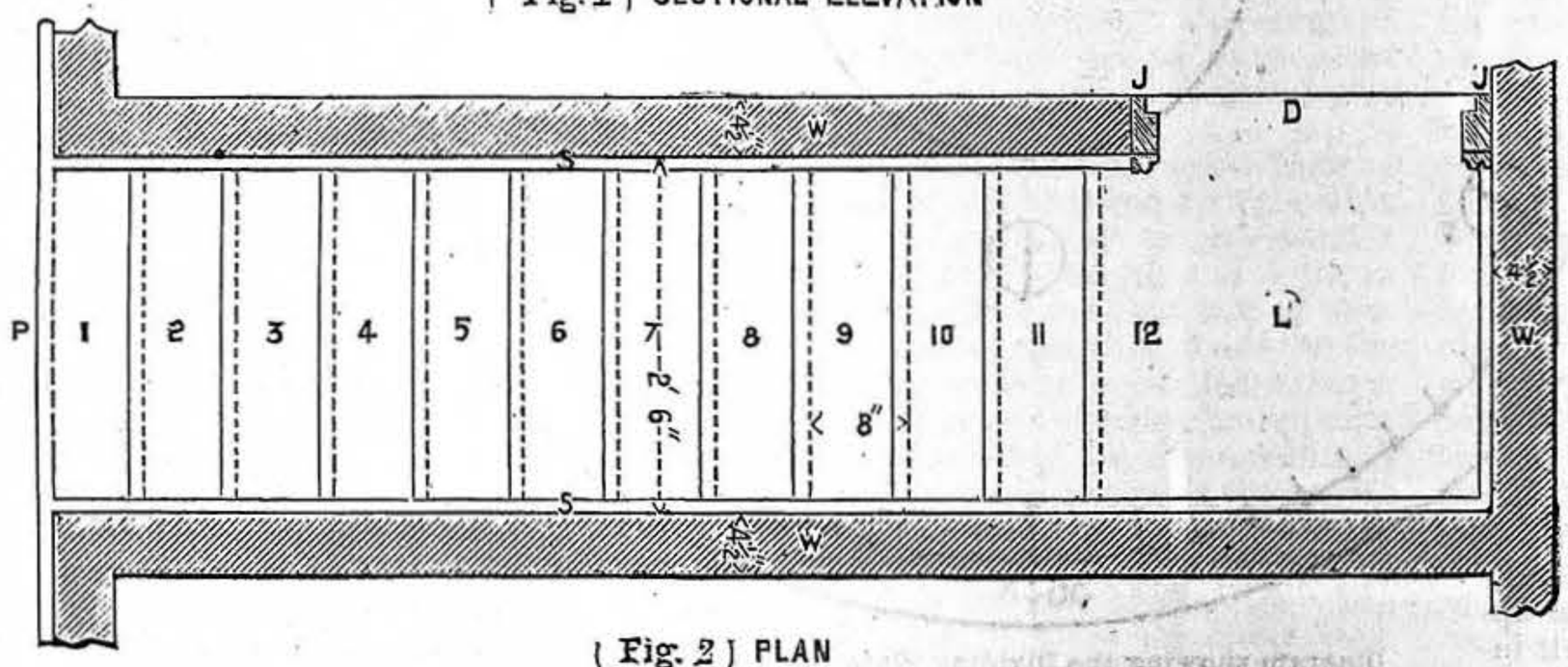

Fig. 2 PLAN

Fig. 3

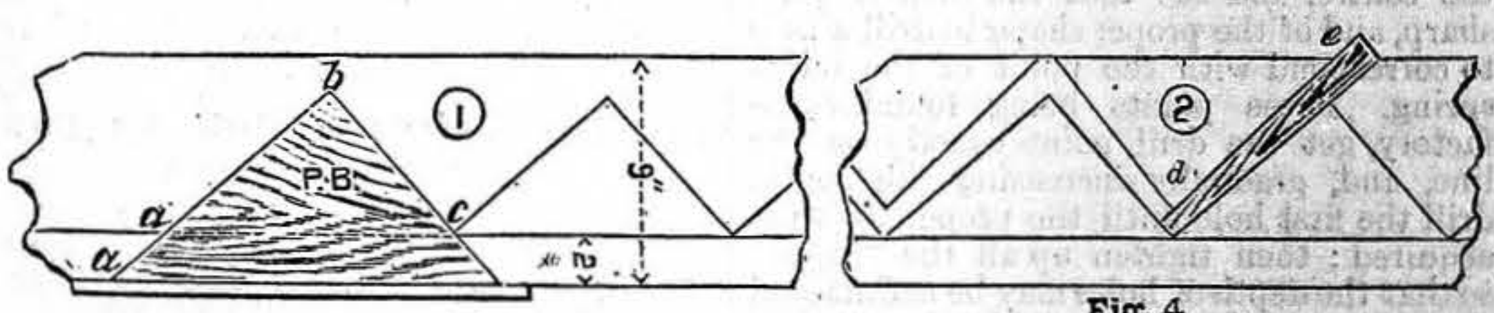

Fig. 4

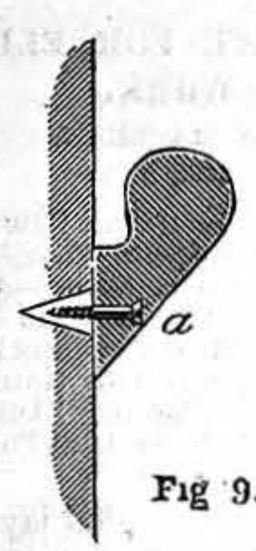

Fig 9.

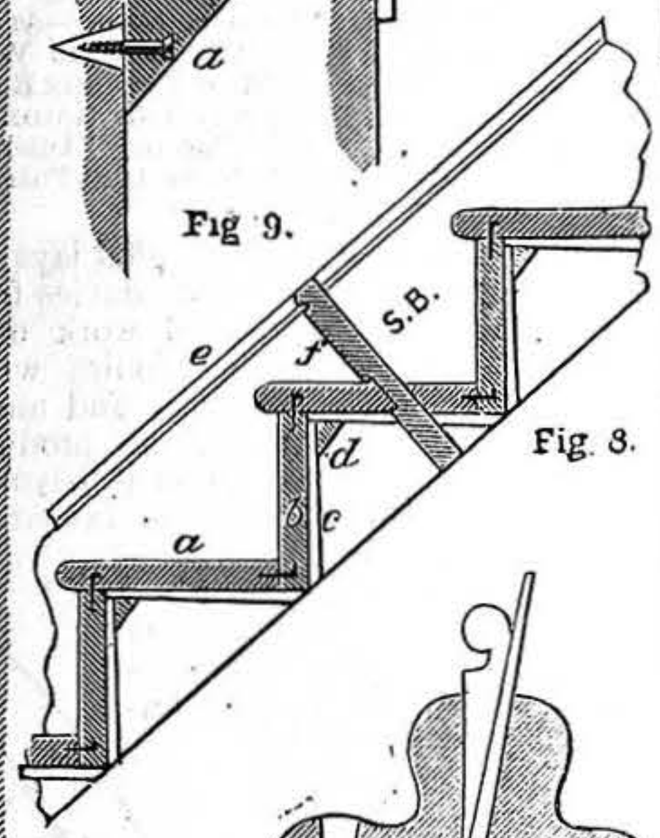

Fig. 8.

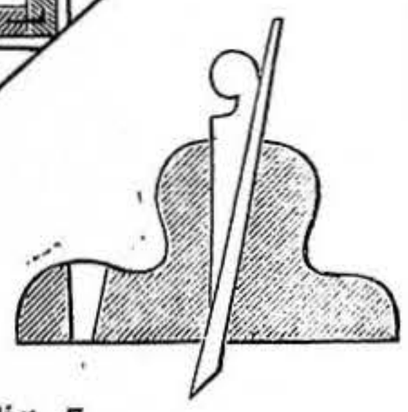

Fig. 7.

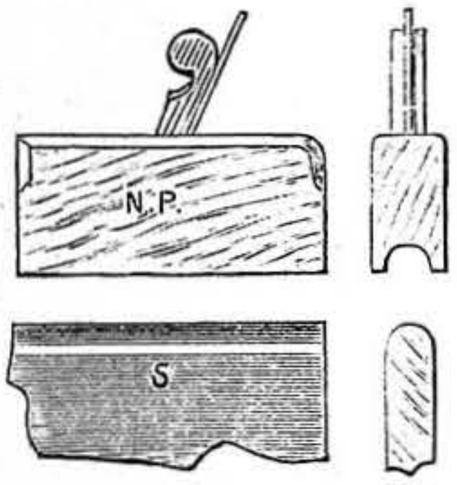

Fig. 6

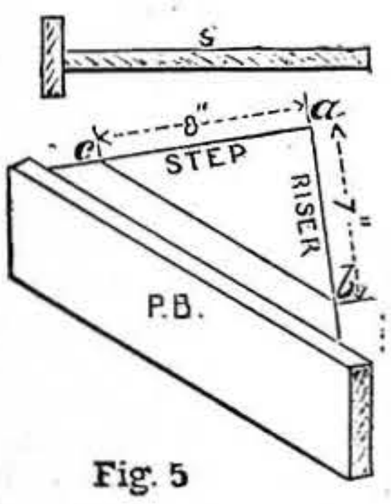

Fig. 5

Staircasing. Fig. 1.—Sectional Elevation—S B, String-board; L, Landing; T, Trimmer; T J, Trimmer Joist; F L, Floor Line; S R, Storey Rod; H, Handrail; G G, Going; H H, Height; A, Architrave; P, Passage. Fig. 2.—Plan—L, Landing; D, Door; J, J, Jambs; W, Walls; S, S, Strings. Fig. 3.—String-board set out for working—*a* to *b*, Line of Nosings. Fig. 4.—Enlargement of String, showing at (1) the Pitch-board, P B, applied to String; *a b* being the Tread, *a b c* the Riser; (2) is the application of Wedge Strip, *d e*; (3) *f* shows Holes bored by Centre-bit, and *g*, space cleared out for Saw. Fig. 5.—Pitch-board, P B—S, Section of same; *a b*, Riser; *a c*, Step. Fig. 6.—Nosing Plane, N P, and part of Step, S. Fig. 7.—Router. Fig. 8.—Enlargement of String-board, S B—*a*, Tread; *b*, Riser; *c*, Wedge; *d*, Block; *e*, Bead; *f*, Section. Fig. 9.—Alternative Sections of Rails *a* and *b*. Fig. 10.—Enlargement of Trimmer, T, etc.—T J, Trimmer Joist; L, Landing; A, Architrave; *a*, Nosing; *b*, Floor-board; *c*, Tusk Tenon.

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EQUALISING DEVICE FOR ELLIPTIC CHUCK WORK.

BY NORMAN MACLEAN.

HOLTZAPFFEL'S DEVICE—ORIGIN OF NEW DEVICE—ADAPTED TO ROSE-ENGINE WORK—ADAPTING TO ORDINARY TURNING LATHE—APPROXIMATE SIZE OF PROPOSED ELLIPTIC WORK—DIVISION PLATES—HOW TO MAKE THE ELLIPTIC DIVISION PLATE—FIXING—THE GUIDE LINE FOR DRILLING HOLES—USE OF "ARROWS"—TO GET THE DIVISION PLATE INTO POSITION—CONCLUDING REMARKS.

Holtzapffel's Device.—Holtzapffel lays down in his text-book an elaborate device for the equalisation of ornamental work on the elliptic chuck, which, no doubt, will be familiar to most professional and amateur turners, and being, like all his productions, most expensive, places it beyond the reach of all except those favoured with a large income.

Origin of New Device—Rose-Engine Work—Adapting to Ordinary Turning Lathe.—Some years ago I was impelled by a commercial necessity to devise a simple dividing apparatus in connection with rose-engine work, which, however, I shall not now describe, as so few of our readers are interested in rose-engine turning, but rather shall show how such a dividing plate may be made for an ordinary turning lathe. My idea is to give such particulars in a clear manner, so that any ordinary workman (and I know some exquisite workmen among those classed as amateurs) may adapt the device to his own lathe at a very small cost, assuming that the workman has already a division plate, a drilling spindle and overhead motion, and an elliptic chuck.

Approximate Size of Elliptic Work.—In the first place it will be necessary to make a rough calculation of the approximate size of the elliptic work intended to be turned, as the size of the work which is to be done will be a guide for the number of holes to be drilled in the new division plate; thus, for an article 6 in. by 4 in., I have found that seventy-two holes have answered very well, making the pattern fit exactly by means of the eccentric cutting frame.

Division Plates.—As the details of division plates of lathes vary very much, I shall leave the workman to his own judgment; the main thing being so to fit the elliptic division plate over the permanent division plate that it can easily be removed when not required.

How to make the Elliptic Division Plate—Fixing.—Procure a sheet of brass or gun-metal of the required size to suit the permanent division plate, and about ¼ in. in thickness; turn up back, front, and edges, and fit and secure by means of six screws (see diagram) on the afore-mentioned plate, taking care to drill the holes for the screws in such a manner as not to obliterate the holes in the plate.

The Guide Line for Drilling Holes.—This being done to the satisfaction of the workman, remove the disc, after numbering the screws so that the same screws shall be returned to their proper places when re-mounted, and re-chuck, getting the disc perfectly true on face and edge on the circular motion; and then cut a deep narrow line on the part it is proposed to drill the circle of holes. Now remove the chuck on which the disc is mounted, and fix the elliptic chuck in position, and screw the chuck home, and see that the disc runs truly by means of the narrow deep line already cut.

Drilling the Holes.—Now set the slide-rest parallel with the disc, and mount the drilling spindle, using the seventy-two row of divisions on the dividing plate, and throw out the elliptic chuck ⅞ in., making a

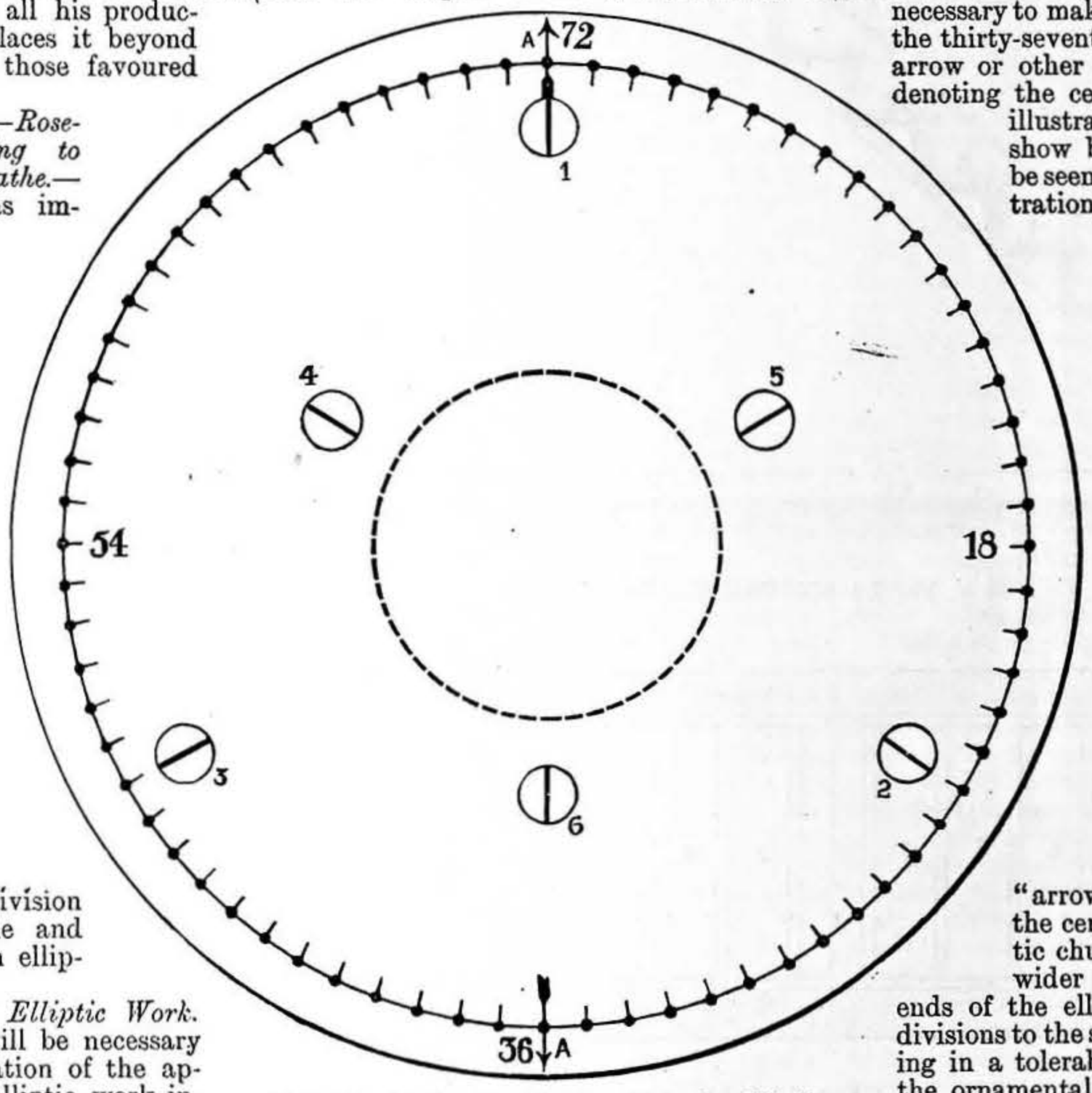

Diagram showing the Dividing Plate for Elliptic Work in Position—A, A, Arrows denoting the Upright, the Elliptic Chuck to be in a direct line with the Arrows; 1, 2, 3, 4, 5, and 6, Screws to hold the Plate to the permanent Dividing Plate.

commencement from the vertical position. Everything now being ready for a start, we will first make sure the slide-rest is in the centre, and see that the drill is quite sharp, and of the proper shape to drill a hole to correspond with the point of the index spring. These points being found satisfactory, get the drill point exactly on the line, and, gradually increasing the depth, drill the first hole until the proper depth is acquired; then tighten up all the "stops" so that the depth of holes may be maintained throughout. Now comes a bit of very delicate work, viz., *to keep the drill holes exactly on the line all round the circle;* as, of course, as the chuck describes the ellipse, the point of the drill will be to the right or the left of the circle according to the position of the elliptic chuck on the lathe. This, although difficult, need not discourage the workman, as, if time is no object, there is no occasion to hurry over the job; but I must confess that a large stock of patience is necessary.

A Simple Way.—The simplest way I can suggest for getting the drill holes truly on the line is, after drilling the first hole, to unship the overhead band, having convenient a leaden weight, with a wire hook attached, to keep the band taut while it is disengaged from the drill spindle; and, while the drill is stationary, shift the point of the drill by means of the winch handle of the slide-rest until it will lie exactly in the circular cut; re-ship the band and drill the hole, continuing the movements until the whole series of holes are drilled.

The Use of the Engraved Arrows.—Noting that the first hole is drilled while the elliptic chuck is in the vertical position, it will be necessary to make a mark at the first and the thirty-seventh hole, in order that an arrow or other mark may be engraved denoting the centre (as shown in the illustration), for reasons I will show by-and-by. It will also be seen, on reference to the illustration, that the circle of holes is composed of increased and diminished intervals, and that the "arrows" are engraved opposite the widest intervals, and the special use of the "arrows" is to denote the proper position of the elliptic dividing plate on the lathe when used for elliptic work.

To get the Division Plate into Position.—To get the dividing plate into position, first move the elliptic chuck into the vertical position, and then, by means of the worm wheel and tangent screw on the *mandrel*, move round the elliptic division plate until the "arrow" is in a direct line with the centre of the vertical elliptic chuck; this will bring the wider divisions to the small ends of the ellipse, and the narrower divisions to the sides of the ellipse, resulting in a tolerably equal distribution of the ornamental work during the course of the ellipse.

Concluding Remarks.—It will be necessary to bear in mind that, whatever distance the elliptic chuck was thrown out of centre for the purpose of drilling the disc for elliptic work, the same degree of eccentricity must be rigidly adhered to when turning any elliptic article. See, too, that the "arrow" is in line with the centre of the elliptic chuck when in an upright position on the lathe.

INDUCTION COILS: HOW TO MAKE AND WORK THEM.

BY G. E. BONNEY.

INDUCTIVE THEORIES ILLUSTRATED BY EXPERIMENTS — HOW THE INDUCTIVE EFFECTS OF ELECTRIC CURRENTS IN A PRIMARY COIL ARE DEMONSTRATED—MAGNETIC EFFECTS OF INDUCTION—CALORIFIC EFFECTS OF INDUCTION — PHYSIOLOGICAL EFFECTS OF INDUCTION.

Inductive Theories.—As WORK is essentially a practical journal, I pass over the theoretical part of my subject with just a glance at the two terms, "practice" and "theory."

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Some persons have an idea that they are terms more or less antagonistic. This is not so. Every man has a theory of his own respecting the way his work should be performed. His theory may be founded on his own experience, or that of other workmen, or it may be framed on his knowledge of natural laws, but it is none the less theory. The theories I shall put forward are those that have been proved by practice, and I hope to show how they may be proved by means of experiments.

How Inductive Effects are shown.—The inductive effects of an electric current are shown in three different ways, and by three different sets of experiments. The first effect may be named magnetic, the second calorific, the third physiological. I am using these three terms more because of a want of better terms, than of their fitness to give an idea of the inductive effects observed. The first shows the relation of electricity to magnetism, the second shows its relation to heat, and the third shows its effects on animal tissues. The first converts soft iron into a magnet, the second is shown by sparks from the conducting wires, and the third by shocks to the nerves of animals.

Magnetic Effects of Induction.—Take a rod of pure soft iron 3 in. in length by ¼ in. in diameter, or a small bundle of straight iron wires of the same length and diameter. Also get some small iron brads or fragments of iron wire, and place these on a smooth sheet of paper. Hold the iron rod to these, or stir them about with the rod, and note that the rod does not affect them in any way, nor do they affect the iron rod. They do not move when the rod is held close to them, nor do they stick to the rod when they are stirred by it. If we bring a toy horseshoe magnet near them they move toward it, and stick to it if brought close enough to them. Now get a few yards of No. 20 silk-covered or cotton-covered copper wire, and envelop the iron rod or the bundle of iron wire with regular folds of the copper wire, laid on side by side so as to form a close spiral from end to end. Connect the two ends of the covered wire to the terminals of a battery, so as to send the battery current through the small coil of wire. Whilst thus connected, bring one of the ends of the iron rod near the bits of iron on the smooth sheet of paper. The bits of iron will be attracted to the rod of iron as to a permanent magnet, thus showing that a current of electricity passing through a coil of wire has an inductive effect on the soft iron within that coil, and this effect is magnetic. When the iron rod has picked up as many of the bits of iron as it will hold, disconnect the end of the covered wire from the battery, whilst holding the iron over the paper. Immediately, on thus disconnecting the wire, the bits of iron will fall off from the end of the iron rod, and thus prove that the inductive effects of the electric current do not remain in *soft*, pure iron, but are only observed whilst current is passing. This property of soft iron is made use of in the construction of induction coils, the cores being made of *soft* iron because this becomes magnetised when a current is circulating around it, but does not remain magnetised when the current is interrupted. As the other inductive effects depend very much on the perfection of the arrangements for interrupting the flow of the current, the use of soft iron is imperative.

Magnetic Effects on Hard Iron.—Take a similar rod of iron and hammer it well on an anvil, or heat it to a red heat and plunge it suddenly in cold water to cool it. This will harden the iron. Wind this with the covered wire as before, and repeat the first experiment with this hard iron, then note the difference in the magnetic effects observed. The hard iron will pick up the iron brads as did the magnet of soft iron, but will not so readily part with them when the current is interrupted. This shows that hard iron must not be used in the cores of induction coils, nor in the cores of electro-magnets.

Magnetic Effects on Steel.—Take a rod of steel of similar size, and make it as hard as it can be by heating it to a bright red and plunging at once into cold water. Wind this with covered wire as before mentioned, and repeat the former experiments, again noting the observed effects. The steel rod will not at first attract the iron brads. When a current is sent through the wire, the rod will pick up the brads, but it will not readily drop them when the current is interrupted. After repeated interruptions of the current, it will not drop the brads at all, because it has become a permanent magnet—that is, it has retained the charges of magnetism induced by the electric current passing through a coil of wire wound over its surface. It is, therefore, altogether unsuitable for use in induction coils.

Experiments with Uncovered Wire.—The student may, if he chooses, repeat these experiments with uncovered copper wire, and thus convince himself that covered wire must be used in making induction coils. He may then coat the core with two or three layers of paper, and wind the uncovered wire over the paper on the core, taking care to keep each coil from actually touching its neighbour. The magnetic inductive effects will be absent from the first, but be observed in the second, although not so pronounced or perfect as when a properly insulated wire was employed.

Calorific Effects of Induction.—Take a straight piece of No. 20 covered copper wire, long enough to form a coil to go around a rod of iron 3 in. in length and ½ in. in diameter: this will take about 5 ft. of wire. Connect one end of this wire to one of the terminals of a three- or four-celled battery, arranged in series, and scrape the opposite terminal with the other end of the wire. A small, bright spark will be seen at the instant of scraping the terminal with the end of the wire. Place a steel file on the terminal, and scrape this with the end of the wire. The spark may then be more distinctly seen. Now bend the covered wire into a zig-zag shape, with folds 3 in. in length, and again touch the file. The sparks will be brighter and thicker. Now wind the wire over the iron rod, but withdraw the rod, and leave the wire as a long spiral. Again touch the file, and note the sparks. The coils of wire have an inductive effect on each other, and this will be noticed by increase in the length and volume of the spark. Now place the iron core in the coil, and again note the spark. It will be increased by the inductive effect of each coil, and the induced magnetism of the iron core. The spark thus observed is caused by a momentary heating of the wire end at the instant when contact is made with the file included in the circuit, and also at the instant when contact is broken. This is due to an insufficient conductor to convey the current, and the spark is caused by burnt wire fragments. If we employ copper or brass instead of an old steel file, the spark will be faint and of the greenish colour characteristic of burning copper. From carbon the spark will be bluish white; from steel and iron it shows all the characteristics of burning iron. Small particles of the points of contact are, therefore, burnt away every time contact is made or broken with the ends of conductors of an electric circuit. If these points are made of an easily oxidisable metal of inferior conductivity, as iron, steel, copper, brass, etc., they soon burn away, and are rendered useless. As the inductive effects desired in induction coils depends so much on the perfection of apparatus for interrupting the current in the primary coil—that is, making and breaking contact between two points in the main circuit—it follows that we cannot employ a metal at this part which might be readily burnt away. We must, therefore, employ a speck of platinum on the point of contact in the breaking apparatus—usually termed the "break" of the coil—because platinum is not so easily oxidised as other metals.

Physiological Effects of Induction.—Whilst conducting the experiments mentioned in the previous paragraph, twist the end of the contact wire once or twice around the forefinger, so as to bring the point of the wire under the first joint, where it can be held with the tip of the thumb, moisten the tip of the forefinger with the dilute battery acid, and touch the file with this at the instant when contact is made with the wire beneath the finger. A tingling sensation in the finger-tips will be felt at the instant of making and breaking contact, if the battery is strong enough to overcome the resistance of the fingers. The sensation will be most pronounced when the experiment is performed with the coil wound on the iron core, and will be intensified by an increase in the number of turns of wire wound on the core. It will also be more intense whilst rubbing the wire end along the teeth of the file, thus causing rapid interruptions of the current.

Take two convenient lengths of copper wire of any gauge, and connect them to the terminals of the battery, one at each end. Clean the free ends of these wires, and bring them into contact across the tip of the tongue. A tingling sensation will be felt in the tip of that member, accompanied by a distinctly acid flavour. Leave on one of the wires, but replace the other with the coil of wire used in the previous experiment. Cross the ends of these two wires on the tongue, and note the increased sensations due to the inductive effect of one turn of wire on another. Repeat this with the iron core in the coil of wire, and note the results. A person's tongue may be in this way educated to take the part of a detective galvanometer, the intensity of the sensations acting as a guide to the intensity of the current. I should not advise the use of this human galvanometer in strong electric currents.

Attach two small wires to the contact points of the circuit—that is, to the end of the wire coil and to the wire from the battery terminal. Cross the ends of these wires on the tongue, and get a friend to make and break contact with the points. The inductive effects of the current can be thus observed.

All these experiments go to prove that the primary circuit of a coil produces inductive effects, since the coils just noted are in the primary, or first circuit, with the generator of electricity. These inductive effects will be remembered when we are constructing the coils described in succeeding papers. In these we shall deal with the secondary effects of induction—that is, the inductive effects produced in a wire separate from the prime conductor, but running side by side with it, separated only from it by an insulator of electricity.

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*** All communications respecting Articles, Designs, and MS. communications for insertion in this Journal, to be addressed to the Editor of WORK, CASSELL and COMPANY, Limited, London, E.C.

HOBBYISTS' EMPORIUMS.—In this superabundant age any suggestion of a want not already more than provided for is apt to be treated as a discovery of the "mare's nest" order, so consistently do the laws of domestic supply and demand work. Judging from not a little correspondence which has reached us, there appears to be a real want in the shape of a ready channel through which the hobbyist—*i.e.*, such professional and amateur workers as those who support this journal—could find a sale, at first hand, for the work which exercises the hand and brain during leisure hours—which evening hours every working man has a legitimate right to turn to his own advantage, provided he does so honestly. By devoting his spare time each week to some constructive work, either in connection with his own occupation or some other pursuit for which he may have a fancy, many a man could appreciably add to his ordinary earnings were he in touch with a market to which he might send his labour with some fair prospect of its finding a buying public at the maker's price. There would be no middleman to weight, say, a bent iron candelabra or a carved sideboard, with the profit which he necessarily derives partly from the underpaid maker and the overcharged purchaser, because manufacturer and purchaser would be brought into first contact. This first hand market between the ingenious workers of novelties which go to adorn a home, and those who have to buy such for the purpose of domestic need and ornament, would be a boon which does not appear yet to be provided for on a business scale. Of course, the charitable bazaar schemes are rampant enough, but bazaar prices and figures belong to a region which practical people are obliged to decline to enter. From communications which have been made to our "Shop" pages, it would seem that a good opening exists for something in the way of dépôts at which professed hobby work could find a first hand sale, whether to the public itself or to the tradesman to sell again would be of no moment to the manufacturer. How this outlet can be brought about, and whether a banding together of the various sections of our readers would lead to some practical results, must depend upon themselves. We have already been instrumental in bringing several correspondents into contact with anxious buyers of fretwork and other novelties, from which it would seem that there are tradesmen willing enough to negotiate for work which WORK subscribers turn out, the chief difficulty being that of want of touch—the one class with the other. Having broached the matter in this way, doubtless many of our readers will favour us with their views, and we shall be pleased to give expression to any useful suggestions. Pending further reference to the subject, however, should any hobbyists be anxious to find a market for their craftwork, twenty words can be had in our "Sale and Exchange" column for 1s., and this is not a ruinous expenditure to make upon an article which, if it changes hands, may be as welcome a transaction for the buyer as for the seller.

PAINTING.—The question of technical education for painters, and that of establishing some satisfactory limit to the number of lads or apprentices employed by each master, are both coming largely to the front this year amongst the various masters' and operatives' trade associations. In the North of England and Scotch centres, the interest in these and other kindred trade problems is very keen. It is a singular and regrettable fact that, whereas in a dozen important towns we may find technical plumbing classes established under the Technical Education Act, in very rare cases can we meet with this encouragement in connection with painting and decorating. This is a matter the Amalgamated Society of Painters could well furnish an instructive report upon, and they should speak up.

LABOUR.—The miners' strike, though productive of inconvenience to general industry, will not have been in vain if it reads a lesson on economics to the world at large. We are all of us held more or less in the leading strings of an effete political economy. Only within certain limits does the supposed law of supply and demand operate. The panic of the public, and the opportunity and greed of the middleman, have lately sent coals up from 6s. to 8s. per ton. Yet the proposed reduction of wages which the miners have fought against would have been covered by 3d. per ton! The cost of miners' labour is an almost infinitesimal fraction in the price of London coal. The miners have opposed a silent but dogged protest against the commercial system, in which they are made the pawns in the great game played by the speculators. The example is sure to become contagious. The complete federation of labour is a dream whose realisation may not be so far distant. Such federation must lead eventually to strikes of immense magnitude, or to co-operative undertakings for production, or to a union of employers and employed in industrial partnerships on equal terms. In our opinion, the establishment and development of profit-sharing enterprises will conduce more than any other measure to the promotion of industrial peace. Many firms have already adopted this system with their workmen, and where it has been tried it has been productive of improved relations between employer and employed. With some houses a liberal benevolent fund scheme is more feasible, and it answers all the purpose.

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A TASTEFUL OVERMANTEL.

BY FLORENCE CADDY.

HERE is an original way of grouping miniatures and very small water-colours into the work of an overmantel, which, while it is inexpensive, is very tasteful.

I suppose every household possesses a few small treasured drawings, perhaps too small to be framed and hung up separately, perhaps even thought not worth framing, but still "family treasures," that teem with memories, that we like to drag from their hiding-place now and then to recall fond associations. If these drawings are miniatures, they generally live in a box; if they are on paper, they are stuck in a scrap album. Now, how charming these treasures would be if grouped together, and thus made the motive of an overmantel in the manner of the accompanying design!

In constructing an overmantel like this one, we will suppose your mantelpiece is 5 ft. 10 in. in length. You will then require a thin oaken board (about three-eighths of an inch in thickness) 5 ft. 6 in. by 1 ft. 10 in. If the board can be all in one piece so much the better. Teak and mahogany and sequoia wood run wide, and might be easier to procure than oak. Bass is a cheap wood, and runs wide, and its white colour would harmonise with many things (blue china especially), and be less heavy looking if required in a drawing-room. Sequoia wood has a pretty pinkish colour and is a cheap wood.

The board is 1 ft. 10 in. at its widest part, from A to B, where it rises in semicircular form; from D to E the board is 1 ft. 3 in. in width; from D to H the measurement should be 1 ft. 5 in.; and from D to the central dotted line between A and B the distance should be 1 ft. 4 in. The length from F to G is 5 ft. 6 in.—*i.e.*, 4 inches shorter than the mantelshelf—thus leaving space for the 2 inch frame of oak, 1 inch thick, which is carried right round the board.

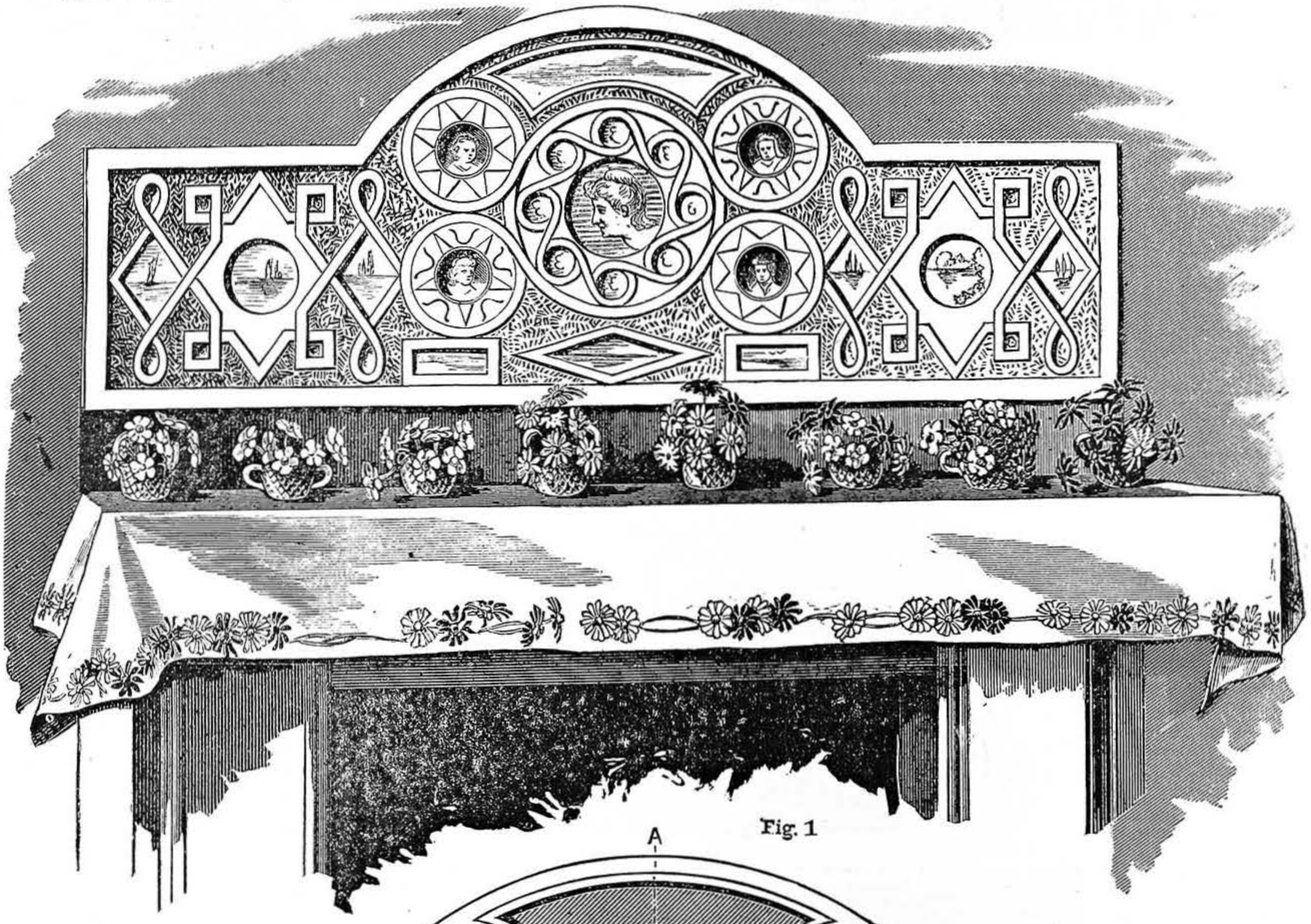

Fig. 1

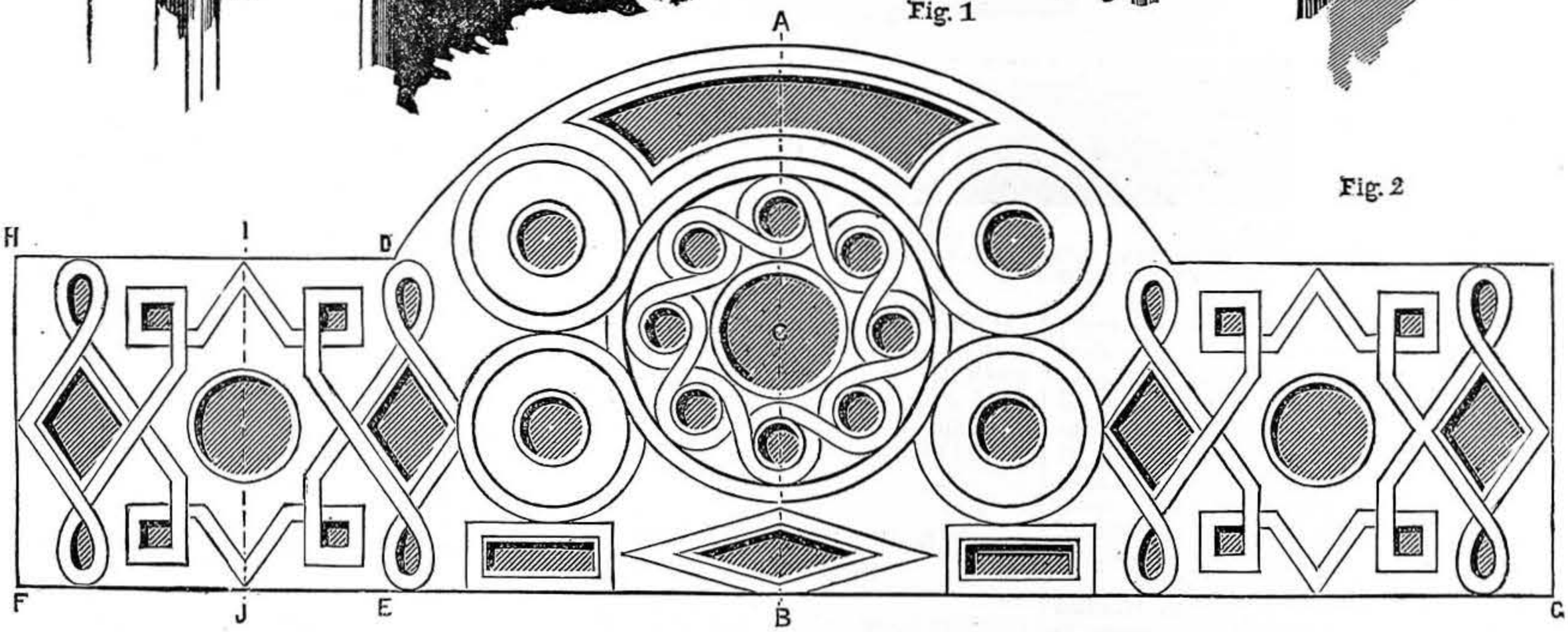

Fig. 2

Fig. 1.—Overmantel complete. Fig. 2.—Working Diagram.

On the board a geometrical pattern is drawn, and round and diamond-shaped holes, according to the pattern, are then made with the fret saw, and the drawings are slipped behind these holes, which act as their frames. The wood is bevelled off round these holes, because the entire thickness of the board (three-eighths of an inch) would cast too much shadow over the small drawings.

The geometrical lines of the pattern are

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carved on the board with a small grooving tool, and the spaces between the pattern are punched. The entire board, with the frame, is then gilt; or the punched part need not be gilt if the plain oak is preferred. Great nicety will have to be observed in cutting the curve of the frame over the semicircular part. The point C is the exact centre of the board, and from that point the compasses should describe the central circles.

If you are making your design on paper, to be traced off on to the wood, you can double the paper down the dotted line between I and J, after drawing half the end portion of the pattern, and trace the other half through at the window. You can also double the paper again between A and B, and trace through the other half of the entire pattern, as it is alike both sides; then paste the paper on the plank, and commence with the fret saw.

A sheet of glass is cut the same size as the *board*, to slip between the gilt woodwork and the drawings, just in the same way as we manage our water-colour pictures; and then the small pictures are very accurately pasted on to the "backboard," so as to appear on the front side through the holes in the gilt board. The mantelshelf is covered with gold-coloured linen, around the edge of which large white daisies with golden eyes are worked in Harris's flax threads. This linen cover can be periodically washed and ironed, which is a great consideration, as the mantelshelf in the "fire season" is the dustiest place in the room. The overmantel is raised seven inches above the mantelshelf, and that space is covered with a strip of gold-coloured linen, worked in a geometrical pattern with large daisies.

The mantelshelf holds a row of small vases of that popular gold and white Viennese china from the well-known shop at the eastern end of Oxford Street; and, when the season will allow, these vases should be filled with large white marguerites, thus keeping the entire mantel decoration a small "symphony in white and gold."

To look harmonious, this overmantel should be in a room where the furniture is enamelled white, and those charming yellow and white Liberty cottons are profusely used for covers and curtains.

This design for an overmantel would look very well if used for old china instead of drawings; plates and saucers would fill the larger holes (which, of course, would have to be cut in proportion to the pieces of china), and broken scraps of treasured Dresden, etc., could fill the smaller spaces. Thus, the tiniest bits of beloved tea cups shattered past mending could be turned to account in a tasteful manner. Especially if you happen to have any broken Wedgwood or small Wedgwood medallions, here is a pretty way of using the little white figures on their blue or green grounds, so that they should not be forgotten or lost.

In using this idea for old china, no sheet of glass would be required; but a back board, with holes cut to semi-insert the saucers and plates and keep them steady, would be a good plan, though more expensive than hooks or brads, for the same purpose.

If filled with china, this arrangement would be a splendid one used as a decoration above a sideboard.

Now that it has become such a favourite plan to turn cottage pianos with their backs out in the room, a difficulty arises as to how these backs shall be draped or decorated. Here, again, this design could be used beautifully for the upper part of the piano back, and a seat could be placed underneath it.

Of course, for this purpose the design must not be so wide as would be required for the overmantel or sideboard.

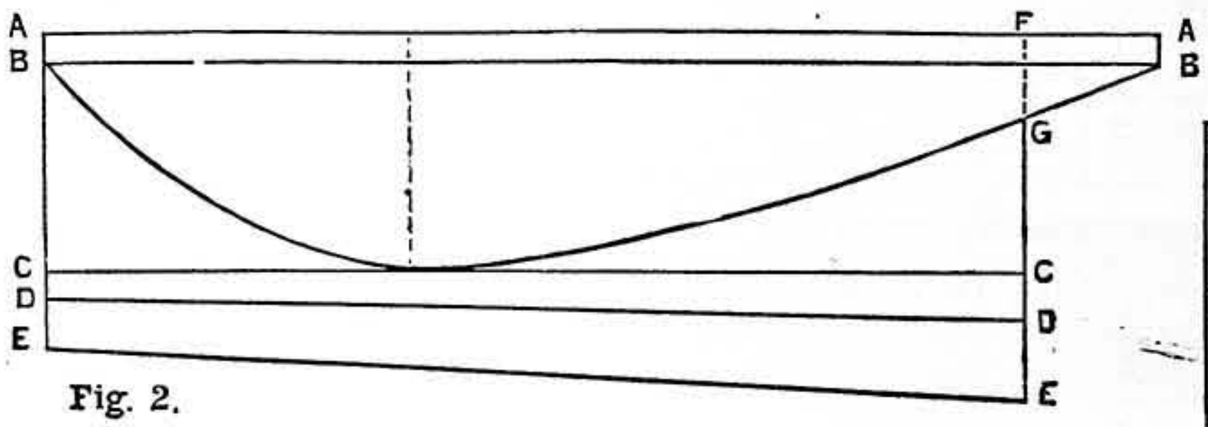

Fig. 2.

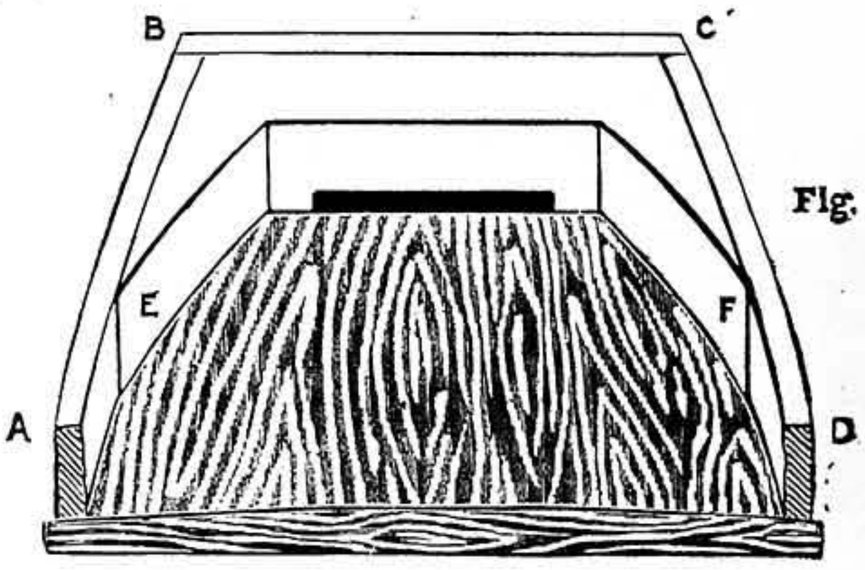

Fig. 4

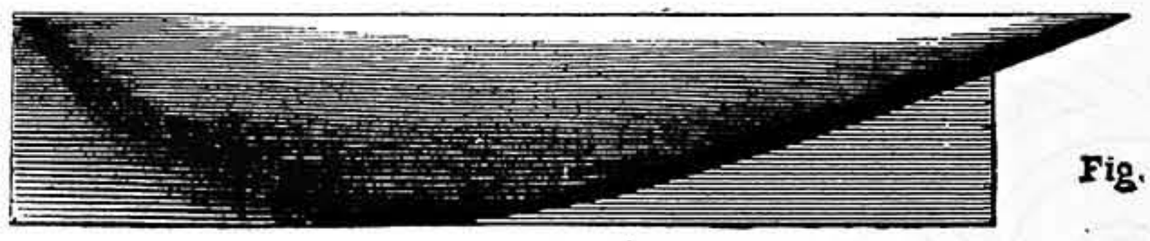

Fig. 3.

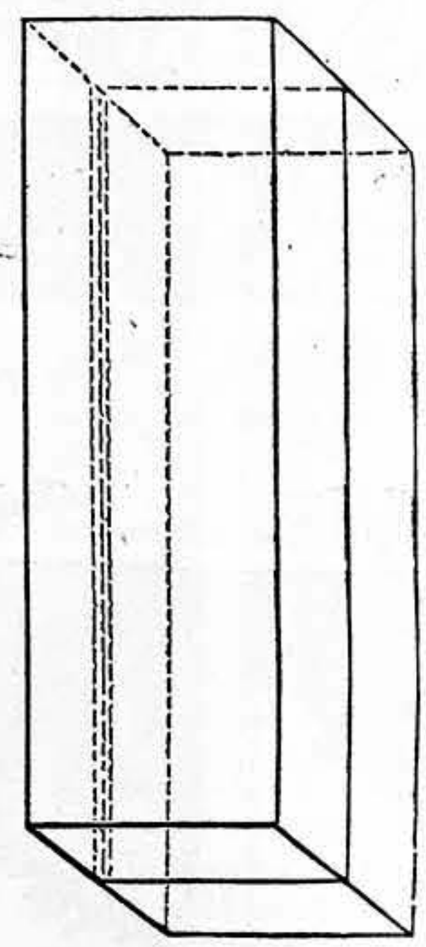

Fig. 1.

Fig. 1.—Block of Wood marked out ready for cutting. Fig. 2.—Side View of Hull, showing various Parts of its structure. Fig. 3.—Shape to be given to Block of Wood. Fig. 4.—Piece of Wood which forms Scuppers.

MODEL BOAT-MAKING FOR BOYS.

BY A CRAFTSMAN.

CHOOSING BLOCK OF WOOD—SHAPING AND FINISHING HULL—FIXING DECK AND KEEL ON.

THE principal thing to be done before commencing the construction of a boat is to get a piece of wood of suitable size and shape out of which to make it. Upon the choice of material the ultimate success of the boat—both while it is being constructed, and during its subsequent career on the water—mainly depends. It should be free from cracks and knots, quite dry, and of a kind of wood easily worked. The wood of the sycamore tree answers all these requirements; it never cracks, soon becomes seasoned, and is easily worked. However, if you are not able to procure sycamore wood, deal or any other soft wood can be used. If you decide on using sycamore, the best thing to do is to procure a portion off a tree of the right length and diameter, and cut it into a rectangular shape, first with a hatchet, and finally with a plane, taking care, of course, that it is thoroughly seasoned.

Having obtained a block of wood of the right dimensions, rule a line lengthways right round it exactly down its centre, passing down the middle of the deck, keel, and bow. Then rule a line on each side of the keel line to represent the thickness of the keel. Fig. 1 is an illustration of the rectangular block of wood with lines ruled round it in this manner, the deck being uppermost. The block is now ready to be cut into shape. Fig. 2 is an outline of the shape in which the hulls of cutters and schooners are generally made. The widest part is usually at a distance from the bows equal to one-third of the entire length. The relation between the width and length varies a great deal, but a good width is one which is a quarter of the length, the depth varying from one-quarter to two-sevenths of the length. If the boat is to be a steamer, the width and depth must be much less in proportion to the length. In Fig. 2 from A to B the hull is built up—*i.e.*, composed of a strip of wood fastened on to the principal block. A wooden keel fixed on to the lower part of the block extends from C to D, and a metal keel extends underneath this from D to E. The dimensions of the various parts of the boat must be fixed upon before the block of wood is chosen, and the depth of it must be equal to the distance from B to C.

Now begin to cut the block into shape. First roughly chop out the interior, leaving the sides about ½ in. thick. This may be best done by boring holes, with a 1 in. centre-bit, close to one another all over the part to be cut out, and chopping away the intervening wood with a chisel. Then turn the block upside down, and shape the outside. In doing this, chop out the keel, except at the widest part, where there is no keel at all (see Fig. 2), with a chisel for about ½ in. in depth. You now have the position of the keel so marked out that it cannot be obliterated. Then shape the sides. These should be made to curve with a continual graceful bend, represented, as nearly as it can be by an engraving, by Fig. 3. They can be roughly shaped with a chisel, and then finished off with a spokeshave or plane. When they are nearly reduced to the right shape, frequently run your eye along the

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keel, and see that both the sides have the same shape. When this has been done, shoot the top of the hull and the keel quite true with a trying plane, and cut the bow and the part of the keel where the rudder is placed quite straight with a chisel. The flat part of the hull, near the stern, can be finished off with a small iron smoothing plane, and the upper part of it should be slightly thicker than the lower part.

Now return to the interior, and finish it off. It should be formed with a curve corresponding to that of the sides, and the wood must be chopped out in small pieces until the sides are sufficiently thin. The thickness of ½ in. would be quite enough for the sides of a 36 in. boat. The interior may be neatly finished off with a smoothing plane, the sole and iron of which have been rounded to adapt them to the curvature.

The wooden keel must be put on next. It consists of a strip of wood, the edges of which have been shot quite true. It must be wider at the end which is placed at the stern than at that which is placed at the bows. It is fixed on to the hull by three or four long screws, and care must be taken in doing this that it does not lean over at all.

When the hull has been finished, the deck must be fitted on. This consists of a board thicker in the middle than at the sides, so that the water which washes over it will run off more easily. It is strengthened underneath by braces of wood fastened across it. Before it is fastened down, all mast holes and hatchways must be cut in it. It can also, if you wish, be ruled with lines to represent the joints between the deck boards, and these lines can be slightly indented with a bradawl. It is then fastened to the hull with nails or screws, its edge being allowed to overlap slightly.

Before fixing the metal keel on, a hole must be bored near the stern for the reception of the upper part of the rudder. Bore a small hole with a gimlet through the deck and hull along the dotted line represented by F G in Fig. 2, and then bore a larger hole down this one with a centre-bit of suitable size. Procure a piece of brass tube which will fit tightly into this hole, hammer it in, and file its ends off even with the wood.

Now fix the metal keel on. This can be made of lead or iron. If of the former metal, it should be cast in a wooden mould of the right shape, and if of the latter, it must be forged by the blacksmith. It should be thicker and wider at the end which is placed at the stern than at the other. It is fitted on to the wooden keel by screws passing through holes bored in it.

The scuppers consist of a piece of wood the shape of which is shown by Fig. 4. A long, shallow groove is cut underneath the central part of it, large enough to allow any water which may be shipped to escape. It is shaped so that it will fit into the end and sides of the deck at the stern of the boat, and is fastened down with screws, which should be countersunk. In Fig. 4 the line passing through A, B, C, and D is the upper edge of the bulwarks, and the carved piece of wood passing from E to F is the scuppers. A thin piece of wood is then fastened on to the back of the scuppers, and is wide enough to cover the part of the hull above which they are placed and the ends of the bulwarks. The portion of the hull so covered is represented by A B in Fig. 2, and so would be below D C in Fig. 4. In my next paper I shall speak about the bulwarks, stand, rudder, deck fittings, hull, capstan, painting, etc. In the meantime, the boys should go to work, and induce others to do the same.

SCIENCE TO DATE.

Discovery in a Tumulus.—During the excavation of a large tumulus in Ohio a human skeleton was found clothed in a suit of copper armour. Around its neck was a collar of bears' teeth alternating with pearls. A quantity of what had been fine pearls was found with the skeleton, but were quite spoilt. A second skeleton—that of a woman—was found by the side of the first. It is supposed that they are 6,000 years old.

Balistite.—The Italian Government have been making experiments on a new explosive which has been called balistite. According to the results obtained, balistite is superior to all the smokeless powders used by other Powers. Amongst other advantages, it is said not to deteriorate the interior of the guns in which it is employed.

Brilliant Varnish for Wood.—A German paper recommends the following varnish as giving most brilliant surfaces and of a durable polish. Further, it browns the wood and brings out the venation. Gum-lac is dissolved in twice its volume of water, and the mixture gently warmed until it has acquired the consistence of a jelly. Two parts of this varnish are mixed with one part of olive oil. A light coat is laid on the wood to be polished, and is then briskly rubbed with a pad to make the varnish penetrate into the pores. It is allowed to dry, and the operation repeated three or four times. After some hours the surface is rubbed well with tripoli powder on a rag soaked in olive oil. The operation is finished by polishing with a wash-leather.

Forgotten Fact.—If sulphur is melted till quite liquid, poured on to a printed paper and allowed to cool, then, after removing the paper by means of sulphuric acid or otherwise, a complete "negative" of the type and illustrations on the printed paper will be found on the surface of the sulphur. Even the finest lines are well marked, and every detail comes out clearly. This fact was observed about fifty years ago, but has, apparently, been forgotten. It might well be available for some interesting industrial application.

Non-explosible Petroleum.—A Hamburg chemist claims to make petroleum non-explosive by the addition of a small quantity of a mixture of bicarbonate of soda, aniline, calcium and magnesium sulphates, salt, sal-ammoniac, and water.

New Phosphorescent Substance.—Zinc sulphide is now being manufactured as a phosphorescent substance. It shines with a greenish light in the dark. The sulphides of calcium hitherto employed are altered by air and moisture, but zinc sulphide is not so attacked, and will, therefore, probably supersede them.

New Method of Insulating Electrical Apparatus.—M. Boudreaux has discovered that paraffin is the most perfect insulator, and has made a series of apparatus for experiments with statical electricity, founded on the employment of paraffin as an insulator. This apparatus will work even when the air is damp, without there being any necessity to heat it. Special arrangements are also made to prevent the access of dust, which is an essential condition for the good working of such electrical apparatus.

Rapidity of the Sun's Revolution.—Prof. Duner, the Swedish astronomer, has re-calculated the time of the sun's revolution from observations made on the displacement of the lines of the solar spectrum in the Observatory at Potsdam. He finds that the sun moves round its axis at the rate of 1 mile 242 ft. per second. The sun's day is therefore equivalent to 25 days 12 hours of our time. Further, he has observed that different parts of the sun have different times of revolution, the latter increasing from the equator to the poles, which is only possible with a gaseous surface.

Electro-magnetic Vibrations.—It is stated that electro-magnetic vibrations can pass through a brick wall as readily as light passes through a piece of glass. In this case it is not too much to expect that we shall have, in course of time, a system of telegraphy without wires.

Solvent for Camphor.—Liquid paraffin is recommended by Rosner as a solvent for camphor. On warming slightly, a perfectly clear and limpid solution is obtained, which can be kept for years.

Silicate of Silver.—No one has yet succeeded in preparing a silicate of silver. Lately, however, a salt of complex composition, containing silica, nitric acid, and oxide of silver, has been prepared.

NOTES FOR WORKERS.

A MR. CAMPBELL, a Canadian, has invented a "cotton picker" which will pick the ripe bolls and leave the unripened ones and flowers for a later picking.

THE Electrical Exhibition at St. Petersburg opened by M. Vishnegradski, the Minister of Finance, has proved a very successful one.

IF the telescope be driven by clockwork so as to keep certain stars always in the field, a planet, if present, can be discovered by a prolonged exposure of a single photographic plate; for while the images of the stars will be dots, the planet will, by its movement, trace a "trail" upon the plate.

THE best plaster of Paris is used for cementing brass collars and sockets to the glass fonts of lamps. Another method is to boil 3 parts resin with 4 parts strong lye, and, when cold, mix with 5 parts of water. Five parts of plaster of Paris is then worked in and applied; it sets quickly, and is said to be unaffected by petroleum.

THE light of the model of Eddystone Lighthouse at the late Naval Exhibition was of 300,000 candles intensity.

PICRO-CARMINE is a good differential stain for microscopic zoological sections, as it stains the several tissues different colours. The specimens should be first soaked well in 70 per cent. alcohol, then put in the stain for a day, then into 70 per cent., and afterwards into 90 per cent., alcohol.

GERMAN silver or nickel silver is brass whitened with nickel. Two parts of copper, one of nickel, and one of zinc are the proportions used for making spoons and forks.

THE Lion Bridge near Sangang, in China, is the longest in the world, extending rather more than five miles over an area of the Yellow Sea. It is supported by 300 stone arches, a marble lion 21 ft. long resting on the crown of each pillar.

AT the Frankfort Electrical Exhibition the total expenditure was 1,362,000 marks, but as the receipts amounted to 1,514,000 marks, there was a profit of 152,000 marks. A mark is worth about a shilling.

A NEW method of straightening steel plates without hammering them has been patented. The heated plate is plunged into the hardening bath, but not left there until quite cold, as is usually done. When only cool, it is taken out and placed between two cold discs in a hydraulic press, which is then screwed down.

To dye wool black, boil it with its own weight of logwood for an hour, and then add sulphate of iron in the proportion of 1 lb. to every 30 lbs. of wool.

To find the capacity of a square or rectangular tank, multiply the length by the breadth by the height. If each measurement be made in feet, the capacity will be obtained in cubic feet.

CARE should be taken in using aquafortis or nitric acid, for if any should touch the skin it will form a bright yellow stain, whereas, if it goes on to the clothes, it will stain them red and make them rotten wherever it touches them.

THE melting point of a body is a particular temperature at which that body begins to melt, and is constant for the same substance under the same conditions.

A GRAMME is the weight of one cubic centimetre of distilled water at 4° Cent.; water being at its greatest density at that temperature.

THERE will be exhibited at the Chicago Exhibition a model of the first telegraph wire, about nine miles long, erected by Morse along the Baltimore and Ohio Railway.

FOR the production of the electric light in Spain 50,000 tons of coal were used during last year.

To protect the puddlers in the iron works in Westphalia from the intense heat, furnace shields are now used. A shield is an iron screen hung from a rail overhead, and is kept cool by cold water running down it from a perforated pipe carried by its upper edge next the furnace to a gutter formed on the lower edge.

THE Tansa Waterworks, Bombay, is one of the greatest feats of engineering in India, and the dam connected with these works is the longest in the world. They are to be opened by the Viceroy this month (April).

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TRADE: PRESENT AND FUTURE.

*** *Correspondence from Trade and Industrial Centres, and News from Factories, must reach the Editor not later than Tuesday morning.*

SILVER AND CUTLERY TRADES.—There is little to note in the Sheffield silver, plated, or cutlery trades, business being, on the whole, dull.

BOOT AND SHOE TRADE.—Trade at Brighton is, as far as bespoke work is concerned, just like the London West-end bespoke, very quiet, with very few exceptions, and most of the large manufacturing centres are in a like condition.

BUILDING TRADE.—In Manchester, the building trade is getting brisk. Plumbing, especially, is looking up. There are many large jobs in hand, and good plumbers can get plenty of work. The general price now is 8½d. per hour. Everyone in the building line is busy in Bournemouth, and it seems there will be a demand presently for more workmen in the bricklaying and carpentering lines. Wages are fairly good for the country, being 7d. and 7½d. per hour. Last summer there was more work than men, and all here were putting in overtime; and from appearances at present, it will be so again shortly.

TIMBER TRADE.—3 by 11 third yellow planks are very scarce just now, and command good prices, as much as £15 15s. and £16 5s. per standard being asked in the trade for this size. Last November the same goods fetched only £12 5s. to £13. Spruce is likely to be very scarce this year, and prices keep firm. Buyers will do well to obtain their requirements at the present quotations before another rise takes place in the market. The stock of spruce in the Surrey Commercial Docks is reported to be at least 50 per cent. below the amount this time last year in hand. At these same docks is another cargo of Jarrah wood unloading. This wood is much to the front for paving. The price is about £8 10s. per load, or 3s. 6d. per foot cube; and as it lasts so much longer than yellow deal, it proves cheaper. Floorings and matchlinings have been a little firmer, but there is small hope of the rise being maintained. Some mahogany put up at public auction lately was well bid for, and was all cleared at an average price of 4¼d.

FLANNEL TRADE.—This—the principal trade of Rochdale and district—is in a fairly flourishing state, and most, if not all, of the mills are working full time. The fact that the contract for the Navy has been placed in the hands of local firms has, no doubt, had some effect in bringing about this improved state of affairs, which, if it will only continue, will be much better not only for the mill-owners and workers, but for the whole town as well.

JEWELLERY TRADE.—The London jewellery trade is in a state of suspended animation. It is alive, and that seems about all that can be said for it. One hears everywhere of manufacturers discharging their men, of shopkeepers discharging their assistants, and altogether the outlook is bad all round.

SHEET METAL TRADE.—In Wolverhampton, the large sheet iron producing Lysaght mills, which have been standing idle some time, are to be restarted. About 1,200 hands are employed, and the announcement of the reopening of these important works has given great pleasure in the town. A large sum is being expended in new plant. Several tinplate works in Wales are suspending business on account of the depression of trade. Three thousand men are out of employment. The London trade is still very quiet, buyers holding out for low prices. Stocks are getting low, and purchases will soon have to be made. Reports from other parts are equally dull.

ENGINEERING TRADE.—Neither the engineering nor the iron trades of the Lancashire district exhibit any material signs of improvement, although in some branches of the former industry a fair amount of activity is maintained. This is notably the case with boiler-makers, who report a considerable quantity of new work coming forward. With machine-tool makers and stationary engine builders, however, trade has a decidedly slackening tendency; while locomotive builders are, as a rule, but little better situated. Orders have, however, been placed with one large firm in the district for a number of six-wheel coupled locomotives intended for the Western Main Trunk Railway and for other lines under the control of the New South Wales Government. It is stated that the order has been given after careful tests of American Baldwin engines upon the lines mentioned, along with those of English make. In the general engineering trade of the district, there is a decided quietening down, little work and but few inquiries being reported from almost every centre, with the exception of Barrow, where both engineers and shipbuilders are busy. Throughout the iron trade business is in a very depressed condition, consumers only purchasing sufficient to meet present requirements. An immense number of furnaces are damped down, only six of the forty in the Barrow district being in blast, while other districts are similarly circumstanced; but, in spite of this, there is no marked upward tendency in the prices. In Manchester, this trade is quite out of joint, for though the coal crisis is practically over, there yet seems no likelihood of a return to activity. Employers complain that the cost of production is so great that they cannot offer prices that will attract trade. A complaint of this nature is very ominous to the workers.

COTTON TRADE.—The Lancashire cotton trade is in a very depressed condition, so much so, indeed, that the advisability of working short time is being freely discussed by the employers' associations. The protracted strike at the Stalybridge Spinning Co.'s mill continues, and a recent attempt to settle the dispute has, unfortunately, failed entirely, so that, after a strike of six months, the prospect of a settlement appears as remote as ever. It is stated that the Employers' Federation has under consideration a proposal to close the whole of the mills in the Oldham, Ashton, and Mossley districts until the dispute at Stalybridge has been settled. If this course is adopted, it cannot fail to have a most depressing effect upon the trade generally, while the labour community will suffer most seriously in consequence. A cotton-spinning concern in the Rochdale district has declared a dividend of 12½ per cent. on the last quarter's working, but, on the other hand, a similar concern has been at a very heavy loss on the same quarter's working; so that it is difficult to decide whether the trade as a whole is in a prosperous condition or not.

PAINTING AND DECORATIVE TRADES.—Although the spring season of London jobbing work has been, so far, one of average business, many workmen have been on the unemployed list. London is never able to provide work for all the painters living in its districts, and the young provincial journeymen, who are at all times flocking to the city, very seldom better themselves by the change. The smaller provincial towns offer to-day the best outlets for energy and decorative skill. If without capital or influence, there is no place in the kingdom less promising for regular employment and steady progress on the part of a raw provincial worker than at the West-end—the district wherein all the most costly work is executed, and the goal to which so many foolishly aspire.

SHIPBUILDING TRADE.—In the shipbuilding trade there is very little being done. Messrs. Laird, of Birkenhead, have just launched a fine vessel called the *Duke of Clarence*, intended for the Irish service. On her trial voyage she steamed an average of 18·8 knots, which was more than that contracted for. In shipping circles, the chief interest is the proposed amalgamation of the British and Foreign and Standard Marine Insurance Companies. This amalgamation will be one of the largest in the world. One of the most successful firms in the shipbuilding trade in Belfast has entered into a contract with the Union Steamship Company, Limited, for the construction of two new steamers for the South African trade. They will be twin-screw steamers, fitted with two sets of triple expansion engines, and will be capable of carrying large cargoes on such a draft of water as will enable them to cross the bars at East London and Durban. They are not intended for high speed, but will have ample accommodation for first, second, and third class passengers.

SHOP:

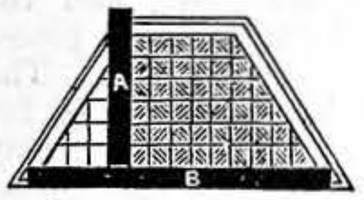
A CORNER FOR THOSE WHO WANT TO TALK IT.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

I.—LETTERS FROM CORRESPONDENTS.

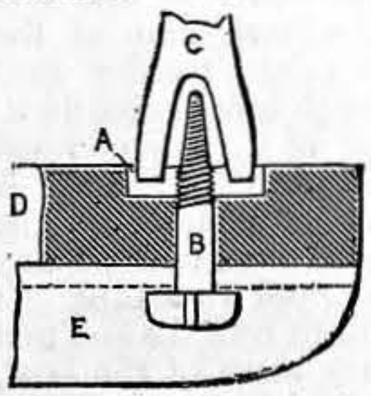
Astronomical Regulator Clock.—T. T. (*Sefton Park*) writes:—"Might I suggest that some contributor would supply a series of papers on the construction of an astronomical regulator clock, with plain dial and dead-beat, to strike the hour, quarter past, half past, and a quarter to the hour, with zinc and steel compensated pendulum? The case might be left to the taste of the maker, if he would recommend a good firm of clock makers to get the parts, finished and unfinished, etc."—[An article upon this subject would be considered.—ED.]

Glass Work.—R. M. (*Croydon*) writes:—"In reference to your article on 'Leaded Glass' (see WORK, No. 147, p. 685), I should proceed with such a job in the following way: First, make out full-size drawing, allowing ¼ in. all round for outside lead to the size and shape required. Next, pin drawing to the bench or board. Next, purchase lead, which is sold at about 4d. per lb., and should be a domestic round lead for body part, and a ⅜ in. flat lead for outside, which, if a trifle too large, could be trimmed down to the size. Next, buy the glass, which would be best if the glass-cutter were to cut it into squares as well as strips for the lines, which could be cut in between squares, or where required, with a wheel-cutter (if a diamond is not to hand), costing about 6d. Having procured the glass and lead, lay two straight-edges down on drawing, marked A and B, as shown: The head is then drawn out straight, and cut off as required, starting from left-hand corner from bottom to top, and so on, until the squares are built in as shown in sketch. Next, take up straight-edge, A, and build in remainder of squares, taking care to put sufficient nails round. Shoemakers' lasting nails are generally used, which have steel points and large heads, and pull out of board easily. Next, cut length of lead for right-hand side of squares, and start putting on lead from the bottom, pulling out the nails carefully as the lead is taken up the side of work. Next, carry up the line, cutting it where required, and so on, following round, taking care, in raising the straight-edges, not to shift the work, and, as each outside head is put on, a straight-edge must be nailed down behind them. Before soldering, square up the work, and then grease the joints with composite candle, which is generally used. After soldering both sides with a hatchet-iron with ¼ in. face well tinned, putty can be worked under the leads, and pricked out with a sharp, hard stick. Next, brush briskly with a stiff brush, and put on the finishing touch with a black-lead brush."—[Many thanks for your suggestion. There is nothing in your very practical description of how to make leaded glass work but what I am fully aware of. I omitted to state that the joints should have a touch of composite candle before soldering, but otherwise I think the answer fitted the peculiarities of the question; and this is the great point.—E. D.]



Glass Lead Work.

How to Grind Skates.—G. E. C. L. (*Ipswich*) writes:—"The winter's frosts must have caused many of our 'workers' to bemoan the condition of their skate edges. Many would doubtless be glad to learn how to grind them in view of next winter. The only things necessary are a small emery wheel, an emery buff wheel, and some means of driving them. Those who have a lathe need only put the wheels in between centres on a mandrel, and they are at once provided for; those without a lathe ought easily to be able to rig up an appliance to hold the wheels. I have found the best size emery wheel to be 3½ in. or 4 in., and buff wheel about 6 in. The emery wheel will cost about 2s.; the buff can easily be made out of a piece of wood about ¾ in. to 1 in. thick, and 6 in. diameter, turned up on a mandrel (which should be about 7 in. or 8 in. long from the live centre end). A piece of a thick strap (a soldier's belt is really the best thing) is glued all round the periphery, and further secured by small wooden pins through the leather into the wood. This is now covered with hot glue with emery powder stirred into it pretty thickly, and when it is cold the buff is ready for use. If the skates have wooden bodies and a screw for the heel, it will be necessary to have a kind of screwdriver to go over the screw to take off the nut which holds the screw to the wood, as shown: If the skates are 'acmes,' or other metal-bodied skates, they can be readily taken to pieces with the key. (N.B.—Keep the parts of one separate from those of the other.) First do the flat sides of the blades with the buff wheel; let the scratches be in the same direction as the maker left them, either crossways or end to end. When this is done, change the buff for the emery wheel. You will require a rest to go in the T holder that is quite flat at the top; I use a piece of wood ½ in. thick, 1½ in. wide, and 4 in. long; the height of this must be *very* accurately adjusted. As the blade is tapered, the rest must be below the centre of the lathe. It is right when, the blade being held flat on the rest, the emery wheel just touches the centre of the edge. Use the emery wheel till you have got the blade free from bad places. Do not press too hard, and be careful not to get the edge wavy, but a regular curve from heel to point (you will find the blade to be far from flat on the edge). When both blades are done, change to the buff again, and finish the edge with that. The centre of the edge will not be touched by the buff; that does not matter. The rest must not be shifted for this finishing. If the edges are too sharp—which is very probable—take a



A, Washer or Nut; B, Screw; C, Screw Point; D, Stock; E, Blade.

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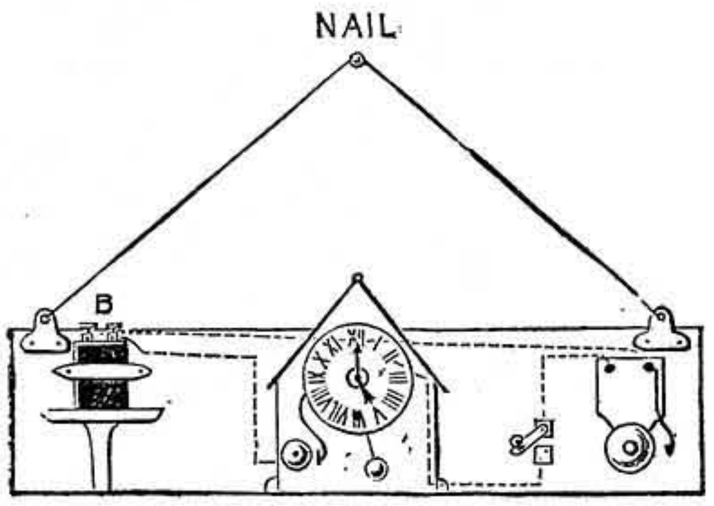
piece of F emery cloth, and with the thumb and finger give the edge one or, if necessary, two rubs, which will rectify the matter. Skates ground like this will not slip from under you sideways when doing the outside edge, three, or any other figure, and will be found to be as swift as any other for plain racing. When once you have got the emery wheel and buff, I do not think you will keep them for mere skate grinding, but will find them invaluable for multifarious purposes."

Oilstone.—J. E. R. (*Limavady*) writes:—"When an oilstone has worn hollow, it is a difficult matter to sharpen wide tools—such as plane-irons—upon it. The following will be found a cheap and efficient substitute—in fact, far better than a narrow oilstone for wide tools and fast cutting. On a bit of board planed true, say, 7 in. square, fasten, by turning down one edge, a piece of sheet zinc, and use this as you would an oilstone, with the addition of a little emery-flour. With this you can put a polish on a plane-iron or chisel unattainable with the oilstone. Anyone who has tried this will always use it for sharpening wide chisels, plane-irons, etc."

Early Riser's Electric Clock.—CAWD HUD writes:—"I send you a sketch of an arrangement (electrical) for waking me up, thinking it may be of service to those of your readers who have to get up early and at irregular hours. The clock, bell, and battery are secured to a board, as shown, and can be hung up anywhere, like a picture. The battery stands on a small bracket, screwed firmly to the board, and lashed with a stout band of tin, about half-way up the cell, as an additional safeguard from upsetting. The clock is fixed by two screws through the back. To connect up, take a wire from zinc direct to bell, bell to switch, switch to clock; here ease one of the screws which hold the works in position, and twist the end of the wire round it. Take the other wire from carbon to back of clock gong, and twist round screw, as before, Now, so bend the hammer of clock that it stands, when not



Early Riser's Clock.

in action, about ⅛ in. from the gong. Wind up the alarm, and the force of the spring will press the hammer tight against the gong, as the disc of the clock works round and releases it. Of course, once winding will do, as the clock alarm cannot go off when the hammer has been bent as described. I may say I can, and do, put every confidence in the bell to wake me, and it has never failed me once since it was put together in January, 1889. It has not required anything doing to it yet, and apparently is as good as it was twelve months ago. Cost, about 7s., exclusive of clock. Mine cost for the lot:—

	s.	d.
Board, 2 ft. 6 in. × 10 in. × ½ in... ..	0	6
3 in. bell (electric)	4	6
No. 2 Leclanché cell	2	0
Ordinary alarum clock	5	0
Wire	0	1½
	12	1½

The switch I made myself. The wires should be run in small grooves behind the board for neatness, and a 'drop' of sealing-wax here and there will keep them in their places."

Mole Traps.—W. S. (*Asby, Appleby*) writes:—"Having seen in 'Shop' queries and answers relative to mole traps, I now take this opportunity of giving a few hints which I can confidently recommend. In the first place, my remarks apply to amateurs, as professionals will know without my telling them. The cheapest and best trap, and handiest in every way, is the tile one made from common drain tiles. Their chief advantages are—durability, inexpensiveness, and being ready whenever wanted. To make them, get a common clay drain pipe 1½ in. diameter, and about 11 in. or 12 in. long. Cut it through the middle, and make two pieces 5½ in. or 6 in. long. The next operation is cutting out the finger-hole at under-side. For this, I found an old hand-saw was best, but as all makers may perhaps not have one, they must improvise something of that nature. After that, cut out the string and trigger holes. For these, nothing is better than an old screwdriver, about ¼ in., filed pretty sharp. The last operation is making the groove for string. For this, drive a nail into a piece of wood that will go into the trap, and work or scrape out the groove at either end. This concluded, the trap is finished. It is of the utmost importance that the tile be *soft*. I could have explained how to make a wooden one, but I have already taken up a lot of useful space. There is not a shadow of doubt but that the wood ones with steel springs are best, but where to get them at a reasonable price I should like to know. One great advantage the tile trap has over wood is that it will neither rot nor crack with sun, and requires no 'seasoning.' I have given no illustrations, as makers will well understand."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Incubator Fittings.—ONE IN A FIX.—You can obtain glass tubes and all other fittings from Mr. Stevens (see advertisement in WORK, "Sale and Exchange" column, No. 149).—LEGHORN.

Working Cordage.—W. H. (*Bradford*).—Being in Naples, and away from all my drawing materials, I cannot well answer queries. The subject is also too wide to be treated of in "Shop." If W. H. was to write to Mr. A. B. Duckham, nautical agent, Falmouth, he would send him a list of manuals (of which there are several) on the subjects on which he wishes for information. He would thus obtain a great deal more knowledge than it would be possible for me to give him within the limits of a short article.—L. L. H.

"Waterbury" Repair.—W. F. (*St. Cross*).—Send to the Waterbury Watch Sales Co., Snow Hill, Holborn, enclosing, say, eighteen penny stamps, and ask them to send a balance-staff complete for the 10s. 6d. watch, and they will do so, and return overplus—if any—or tell you if not enough sent. Then unscrew the plates, draw out the pin that holds the hairspring at present, and put in the new one. You may not get it in beat at first, but by drawing the hairspring farther through or letting it out, you will soon get it right. It is a very easy and simple job, and I have no doubt you can manage it. If not, write again, and state the difficulty.—A. B. C.

Electric Light Batteries.—E. G. (*Dublin*).—The following numbers of WORK contain the two articles on "Electric Lighting by means of Primary Batteries": Nos. 82 and 89. These can be sent you on receipt of 3d. in stamps. Page 593, containing illustrations of electric light batteries, is in No. 89. As you have the indices to Vols. II. and III., you will be able to find several references to information on electric light batteries in "Shop."—G. E. B.

Camera.—BASEBOARD.—(1) The length is 9¾ in. (2) 8¼ in. sight rebate measurement is 8½ in. Fig. 8 fits into rebate in outside case. (3) The bellows is merely slipped out of the metal grooves, pushed into the camera casing, and the baseboard folded up, thus enclosing the bellows part in a box, as it were. The hinge permits the baseboard to be rather longer than it otherwise would be, and forms the lower part of the rigid back framing.—D.

Tin Goods, Lacquer, etc.—S. S. (*Grantham*).—For ready-made tin goods, try Ponders & Baker, Featherstone Street, London, E.C., or Harding & Son, Long Lane, Borough, London, E.C. For lacquering, see reply to H. J. (*Oxford*). Your query *re* spark preventer has been answered.—R. A.

Cycle Tire.—E. D. (*London, S.E.*).—The tire cannot be mended by dissolving, as your correspondent proposes. To mend the tire, cut out the damaged part. Cut the two ends for splicing, as illustrated in No. 137, Vol. III., of WORK, and join with rubber solution, all as described in the accompanying letter-press. The rubber solution can be had of cycle dealers; bottles, 1s.—A. S. P.

Cement for fixing Silver Mounts on a Jug.—W. M. (*Market Drayton*).—Properly mixed and properly applied, thin fine plaster of Paris should hold these mounts on securely. Is the mount deep enough, and is the surface of the jug, where the collar comes, suitably roughed so that the plaster will get a hold? I know of nothing else to use but plaster of Paris.—H. S. G.

Wood for Zither.—YOUNG CABINET.—The belly may be made of cedar, rosewood, pine, or maple, and the back of pine, or even of common deal, if free from shakes and knots. The wood known as Swiss pine, however, gives the best results, and you can procure it from De Witt & Palmer, Drummond Street, Hackney; or you can obtain backs and bellies already cleaned up, at 1s. 6d. each, from Chilvers & Co., St. Stephen's, Norwich. Watch WORK advertisements.—R. F.

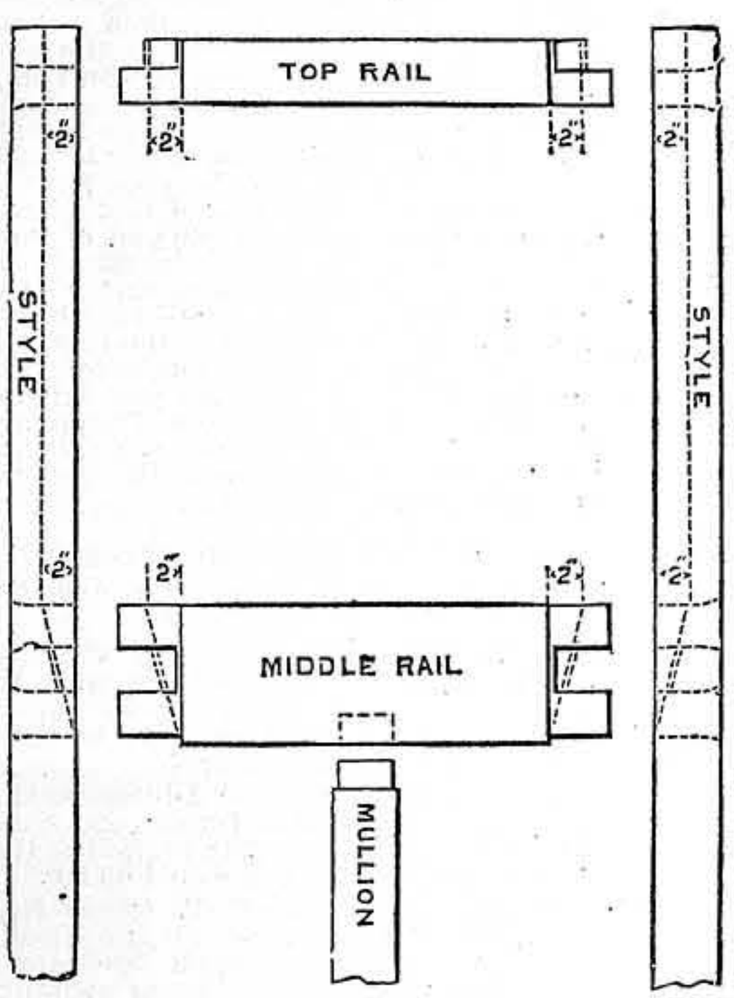
Mechanical Drawing.—READER (*Knutton*).—Perhaps Dawson's "Drawing for Machinists," 4s. 6d., might suit you. Try, too, the book on the subject in Cassell's Technical Series.—F. C.

Carpenters' Basses.—CONSTANT READER.—I know of no carpenters' basses that lock, neither can I see the utility of locking a basket that could be easily ripped open with a pocket-knife. As a rule, carpenters generally keep what tools they are not using in a tool-chest, and only use their baskets as a means of carrying about those they immediately require; but if I come across such a thing as you want, I will let you know.—E. D.

Incubator.—CHICK.—For method of fixing regulator tube, see reply in "Shop" to F. H. For regulator tube, etc., send to Mr. Stevens, who advertises in WORK, No. 149.—LEGHORN.

Wool Winder.—E. D. (*Woodford*).—Thanks for your views. We shall be glad to see your idea when ready.

Sash Door.—SUBSCRIBER.—There is very little difference between the making of a diminished style and an ordinary door. I gave a description of how to make a four-panelled door in No. 144 of WORK; and if you look at that, you will easily understand what I am going to say. Proceed to make your door exactly as if the styles were not diminished, leaving out, of course, the top panels and mullion. You might even do all the mortising. When you have got so far, all you have to do is to make up your mind how much you will diminish the styles—say 2 in.; then gauge 2 in. down the upper inside portion of styles, both sides, as far as the top of middle rail, and then splay the line off to the bottom line of middle rail, as dotted line. Now, as you are going to cut 2 in. out of the styles, you must add 2 in. on to each end of top rail, and 2 in. on to each end of top of middle rail, and then make your splay down to the bottom of middle rail to meet shoulder line that would be if the door were not diminished; there being, of course, no plough groove, you must make the haunching for the top and middle rails. The diminishing of styles is done



Sash Door. Elevation of Part of Door. Dotted Lines indicate the difference between a Diminished Style and an ordinary Door.

by cutting as near as possible to the gauge line with a sharp saw, and finishing with a bull-nose plane and chisels where you cannot get with ordinary planes. I have purposely left out the sash moulding round the opening, for it makes the job ever so much more confusing to a novice, and suits every purpose where a novice would want to make a door of this description if it is struck separately, and mitred and nailed round afterwards. I am sorry to say that I can give you no information as to the best method of making gun-stocks, for although I could readily make one myself, if I had to do so, with spokeshaves, files, chisels, etc., that would not be the best way, for I believe they are mostly turned.—E. D.

Photographic Stand.—R. S. (*Blackburn*).—The motive power of the revolving stand is an ordinary bottle-jack, around which the shelving to hold the photographs is placed. On account of the position of the weight, it is necessary to have the lower part very heavy. The jack is enclosed by the shelves, or it can be hung out of sight above, a chain or cord supporting the revolving arrangement. The place of the shelves is a matter of taste, and the motive power should be hidden in all cases. Figs. 1 and 2 will give an idea of how to work it. Fig. 1

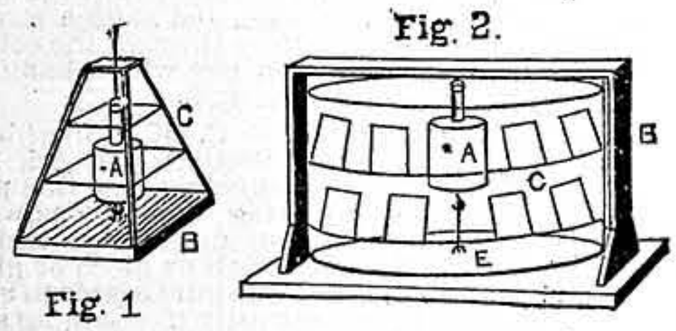


Fig. 1

Details of Revolving Photographic Stand.

represents the suspended arrangement: A, jack; B, heavy board; C, frame on which shelves are placed for the pictures—the frame should be covered with light wood to hide the jack. Fig. 2: A, jack; B, strong frame to support jack; C, cylinder revolving inside from B, attached to a heavy bottom, E. The cylinder can be made hexagonal, and shelves arranged on the outside.—D.

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Boys' Carpentry. — BLUECOAT BOY. — Some papers of this nature are appearing in the present volume of WORK. The first paper, dealing with rabbit hutches, was in the last number (159), so that you ought to be sharpening your tools.

Design and Decoration.—ARTS AND CRAFTS WORKER.—Arrangements are being made by which design subjects by trained decorators will find frequent place in the new volume—*i.e.*, from No. 157.

Xylonite.—H. B. (*Leeds*).—Your full address is asked for by R. J. H., 85, Gardiner Street, Dublin.

Stain for Chair and Upholstering.—AMATEUR.—To darken, as you say, the birch frame of your chair, wipe over with asphaltum dissolved in turpentine (one pennyworth in half a pint of turps). This should answer your purpose admirably, as it stains without giving it a painted appearance; but should you have any difficulty in obtaining this, you should fall back on vandyke brown. To use, take a little of the brown, mix into a thin paste with liquid ammonia—or a strong solution of common washing-soda will do—then thin down with water till you obtain the required tone, which you will readily gain by trying its effects on any odd bits of wood you may have left over when making your chair. As you cannot French polish, the most suitable varnish to use is that known as brown hard spirit varnish, which can be bought at most oil and colour merchants in small quantities more cheaply than you can make it. Should you prefer to make your own varnish, one suitable for your purpose can be made by dissolving 4 ozs. of best orange shellac and 2 ozs. gum benzoin in one pint of wood naphtha. Crush the gums; stir up frequently till dissolved. Strain carefully through fine muslin before using, and apply with a camel-hair brush. For particulars of how the edges of the seats are brought up square in upholstering, I must refer you to Nos. 78 and 100 of WORK, in which you will find "An Arm-chair: How to make the Frame and Upholster it." The subject is there more ably and fully treated than it would be possible to condense into the "Shop" columns.—LIFEBOAT.

III.—QUESTIONS SUBMITTED TO READERS.

**** The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

Storm Glass.—CAWD HUD writes:—"Can anyone of your numerous readers tell me what the ingredients of the storm glass, usually manufactured in America, and sold together with the ordinary mercurial thermometer, are?"

Glass Boxes.—HANTS writes:—"Address wanted where plain white glass boxes (small), glove and handkerchief sizes, can be bought; or, failing this, directions for making a glass box would oblige."

Knife-Cleaning Machine.—F. T. (*Stoke Newington, N.*) writes:—"I should be much obliged if any brother reader would give me instructions in WORK for making a cheap knife-cleaning machine."

Red and Green Fire.—A. J. W. (*Battersea*) would be very much obliged if any kind reader would tell him how to make red and green colour fire powder for parlour amusement.

Ice Cream.—J. W. (*West Brighton*) will thank any reader for a recipe for making ice cream to sell at ½d. and 1d.; also where could be bought a small ice cream machine, and price.

Engineer's Qualifications. — JUNIOR ENGINEER writes:—"Will any reader tell me whether it is necessary to be 'bound' in order to become a M.I. Mech. Engineers?"

Fret Market and Monogram.—S. W. (*Chesham*) writes:—"Will FRETWORKER, in No. 150, page 733, under the heading of 'Market for Fretwork,' kindly send me his address, as I have a few simple brackets I want cut, and have not time to cut them myself? And will someone kindly give me S.W. monogram for painting?"

Bevelled Lamp Glasses. — POOR TINKER writes:—"Can any reader give me address of a firm who sells bevelled lamp glasses wholesale?"

Oilstone. — W. J. (*Browney Coll.*) writes:—"Would any kind reader tell me if there is any way of softening an oilstone? I have one which looks all right, but when I come to sharpen anything on it it scratches."

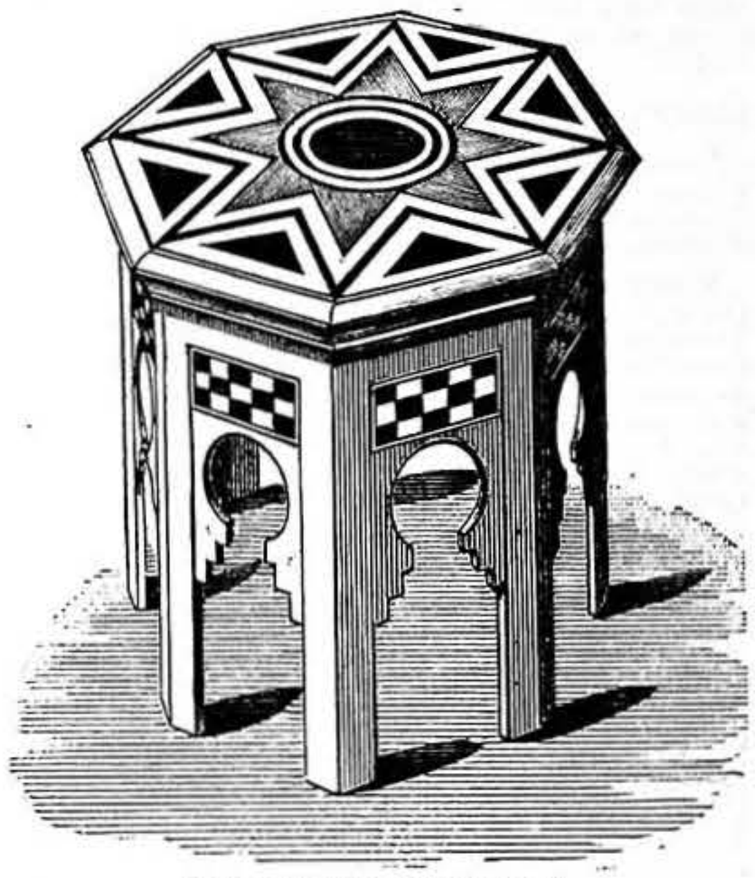
IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Magnetism.—M. (*Bishop Auckland*) writes to BEGINNER (see No. 152, page 765):—"Insert the bars in a coil of covered copper wire, and send a strong current from a powerful battery through the coil of wire, tapping the ends of the bar with a hammer during the passage of the current."

Colours for Diagrams. — C. K. (*Stratford*) writes, in reply to A NEW READER (see No. 152, page 765):—"Effective opaque colours for this purpose may be formed by using the dry powder colours, sold by oil and colour dealers, ground up with flake white on a china slab or piece of glass with a palette-knife. Add a little gum arabic to bind the colours; add a larger quantity if a shining surface is desired. To prevent crayon drawings from smudging, dissolve a small quantity of shellac in methylated spirits, and with a spray diffuser cover the surface of the drawing or diagram with this solution. For dealing with large diagrams, Hughes' 'Aphicide,' or Spray Diffuser, will be found very effective."

Double Flageolet. — M. (*Bishop Auckland*) writes to S. (*Bristol*) (see No. 148, page 702):—"You will most likely be able to procure one of these from Wallis & Son, Euston Road, London, or of Alphonso Carey, Newbury, Berks."

Octagonal Moorish Stool. — J. F. (*Exeter*) writes, in reply to ANGLO DANE (see No. 153, page 782):—"I enclose a sketch for ANGLO-DANE.



Octagonal Moorish Stool.

This could be easily made by an amateur. The best colours to use would be chocolate and dark reds, with a few lines of black in the mouldings and elsewhere to separate the colours."

Lead Weight.—EDDIFRA writes, in answer to W. W. W. (*Nottingham*) (see No. 153, page 782):—"The best way to make pattern would be to make it in two pieces, jointed at A, Fig. 3, the two pieces to be pinned together: the position is shown at E, Fig. 1. I should make it of mahogany. You will want a three-part moulding-box; it could be made of wood, as shown in sketches. The pieces of wood, F, Figs. 1 and 2, are for the purpose of guiding the boxes when they are being put together. The drag, B, Fig. 3, is placed on a level place and filled with sand, of which any iron or brass moulder will give you a tinful. If W. W. W. could get some of the fine dust that collects on the beams of a foundry, and mix it with the sand, it would be much improved. The pattern is then pressed in the sand, and joint made level at A, Fig. 3. Parting sand is

Fig. 1. Fig. 2. Fig. 3.

Moulding-Box Plan.

then sprinkled on the joint—sand that the fettlers brush off the iron castings is much used; the middle box is placed in position, and sand rammed round pattern. Make joint level with top of pattern, and place on top box a piece of round wood—a lead pencil will do—where runner, G, Fig. 2, is shown, and ram sand all round. Draw pencil out, draw off top box, scoop out runner, rap the pattern, and draw the top part out of sand. The pattern will, or should, part at A, Fig. 2. Take off middle box, and connect the runner with impression of pattern; or it can be done before the pattern is taken out. Rap the lower half of pattern, and draw it out. Place the boxes together and run in the metal. I should make a mixture of 9 parts lead and 1 part zinc; it will be a much harder metal than lead alone, and the mouldings will stand more knocks."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—H. N. (*Warbleton*); HALIFAX; G. W. C. (*West Butterwick*); D. G. (*Blairgowrie*); A. B. (*Sheffield*); R. M. (*Barnsbury*); C. C. (*North Britain*); FRAME MAKER; W. D. (*Peckham*); ALPHA; C. W. (*Salop*); LEVER; G. N. (*Henley-on-Thames*); H. C. (*Old Charlton*); H. L. (*Oxford*); S. & J. (*Lhanbryde*); J. R. (*Bagnalstown*); W. W. (*Nunhead*); L. D. (*Birmingham*); N. P. B. (*Finsbury*); A NEW READER; A. W. P. (*Leeds*); J. H. B. (*Pendleton*); SURVEYING; J. D. (*Aberdeen*); A. B. C. (*Arbroath*); MECHANICIAN; A. A. P. (*South Shields*); AN OLD SUBSCRIBER; W. W. N. (*Leeds*); J. J. (*Ottawa, Canada*); JIFF; CYMRO; G. S. B. (*Huddersfield*); J. W. B. (*Paddington*); H. M. H. (*Cambridge*); J. W. M. (*Stepney Green*); MESSRS. E. M. K. & CO. (*Dublin*); ASPIRANT; P. T. (*Pennington*); W. B. (*Walthamstow*); BASHER; E. E. G. (*Portsmouth*); C. W. (*Duns*); C. C. A. (*King's College*); J. H. (*Bishophill*); JAY BEE; PROBYN; CHAPEL KEEPER; R. M. B. (*Liskeard*); W. S. (*Leeds*); W. H. (*Liverpool*); SPECTEMUR AGENDO; TIDDLER; D. W. (*King's Cross*); C. W. (*Leeds*).

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